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DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

MINERAL ANALYSES

FROM THE

LABORATORIES OF THE UNITED STATES GEOLOGICAL SURVEY

1880 to 1903

TABULATED BY

F. W. CLARKE, Chief Chemist

WASHINGTON

GOVERNMENT PRINTING OFFICE

1903

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., October 3, 1903.

SIR: I have the honor to transmit herewith a paper entitled "Mineral Analyses from the Laboratories of the United States Geological Survey, 1880–1903, tabulated by F. W. Clarke, Chief Chemist." Much of the material of this paper is unpublished, and it is very desirable that the whole should be printed in a conveniently accessible form.

Very respectfully,

GEORGE F. BECKER,
Geologist in Charge,
Division of Physical and Chemical Research.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

MINERAL ANALYSES FROM LABORATORIES OF UNITED STATES GEOLOGICAL SURVEY, 1880-1903.

Tabulated by F. W. CLARKE, *Chief Chemist.*

INTRODUCTION.

In the present bulletin I have brought together and classified 507 analyses of minerals from the laboratory records of the United States Geological Survey. A large proportion of these analyses have been already published elsewhere, but they are so scattered that their collection in one place seemed to be desirable. Over 150 distinct species are represented, and among them a considerable number were originally described by chemists connected with the Survey. These species are josephinite, cuprobismutite, warrenite, guitermanite, elpasolite, zunyite, ptilolite, hydronephelite, lucasite, antlerite, knoxvillite, redingtonite, plumbojarosite, emmonsite, and powellite. In other cases minerals which were imperfectly described have been more sharply characterized and their true composition made known. Natrojarosite, for example, is here definitely recognized as a species.

In general the order of Dana's classification has been followed, but with some small variations. Thus the tellurides are put in a group by themselves, the borosilicates are brought together, while the phosphates, vanadates, and arsenates are given as three separate classes. On purely chemical grounds these changes are warranted; on morphological grounds the usual mineralogical classification may be better.

Detailed descriptions of the various minerals have been purposely omitted. Neither are the analyses discussed. These deficiencies, however, are mitigated by the literature references to descriptions published elsewhere. Such references as "annual report," "bulletin," or "monograph" relate to the regular publications of this Survey; all other references are easily recognizable.

I. NATIVE ELEMENTS.

GOLD.

From Persia; exact locality unknown. Analyzed by Charles Catlett.

Au	93.24
Ag	6.65
Fe	.11
Cu	none
	100.00

JOSEPHINITE.

A nickel-iron alloy found in placer gravels in Jackson and Josephine counties, Oreg. Described as a new species by W. H. Melville, Am. Jour. Sci., 3d ser., vol. 43, 1892, p. 509. Waterworn pebbles. Specific gravity, 6.204.

Ni	60.45
Co	.55
Fe	23.22
Pyrrhotite	.55
Chromite, Magnetite	.12
Cu	.50
As	.23
Cl	.04
Silicates (anhydrous)	12.26
H_2O below 100°	.81
H_2O above 100°	1.12
Volatile matter	.70
CO_2	trace
	100.55

The silicate admixture, including the water, amounts to 13.38 per cent, of which 12.88 per cent, soluble in hydrochloric acid, is serpentine. The insoluble portion may be bronzite. Analyses of the silicates are as follows:

	Total.	Insoluble portion.	Soluble portion.
SiO_2	5.14	0.23	4.91
Al_2O_3	.33	.03	.30
Fe_2O_3	2.08	.04	2.04
NiO, CoO	.32	trace	.32
CaO	1.62	.06	1.56
MgO	2.69	.14	2.55
Na_2O	.08	.....	.08
H_2O above 100°	1.12	.....	1.12
	13.38	.50	12.88

For analyses of nickel-iron of meteoric origin, see Bulletin 168.

II. SULPHIDES AND ARSENIDES.

BISMUTHINITE.

From the Rosario Mining District, Sinaloa, Mexico. Analysis by W. H. Melville. Described by him in Bulletin 90.

Bi	72.90
Pb	6.03
Cu	1.67
Fe	.35
S	18.11
Quartz	.63
	99.69

METACINNABARITE.

Crystallized material from New Almaden, Cal. Analysis by W. H. Melville. Not free from admixtures.

Hg	78.01
S	13.68
Fe	.61
Co	trace
Zn	.90
Mn	.15
$CaCO_3$	.71
Quartz	4.57
Organic matter	.63
	99.26

Another specimen of metacinnabarite from Knoxville, Cal., gave Melville the following figures:

HgS	98.48
FeS	.69
SiO_2	.71
	99.88

The latter mineral was described by Melville and Lindgren in Bulletin 61.

COVELLITE.

From the East Greyrock mine, Butte, Mont. Collected by G. W. Tower. Analysis by W. F. Hillebrand. Color, indigo-blue. Massive. Specific gravity, 4.76 at 26°.

Cu	66.06
S	33.87
Fe	.14
Insoluble	.11
	100.18

POLYDYMITE.

A massive ore from the mine of the Canadian Copper Company, Sudbury, district of Algoma, Ontario. Specific gravity, 4.541. Analysis by Charles Catlett. Described by Clarke and Catlett in Am. Jour. Sci., 3d ser., vol. 37, 1889, p. 372. Composition nearly Ni_3FeS_5.

A. Actual analysis.

B. Analysis corrected by deduction of quartz and chalcopyrite.

	A.	B.
Ni	41.96	43.18
Fe	15.57	15.47
S	40.80	41.35
Cu	.62	.....
SiO_2	1.02	.....
	99.97	100.00

Another nickel-iron sulphide, from the Worthington mine, Sault branch of the Canadian Pacific Railway, 25 miles west of Sudbury, has been analyzed by W. F. Hillebrand. Grayish, with a cast of yellow. Not pyrrhotite. Possibly a mixture of polydymite and pyrite.

Fe	38.36
Ni	4.57
Mn	.10
S	45.11
SO_3	.95
CO_2	[a]1.49
CaO	1.91
MgO	.41
H_2O at 105°	.55
Insoluble	4.80
	98.25

STROMEYERITE.

From the Silver King mine, Calico, San Bernardino County, Cal. Specific gravity, 6.28. Analysis by W. H. Melville. Described by Melville and Lindgren in Bulletin 61.

Ag	53.96
Cu	28.58
Fe	.26
S	15.51
Residue	1.55
	99.86

SULPHIDE OF SILVER, COPPER, AND ZINC.

Massive, resembling bornite. Apparently homogeneous, but may be a mixture. Specific gravity, 5.407 at 20°. Analyzed by W. F.

[a] Calculated to saturate CaO.

Hillebrand and described in Bulletin 55. From the Gagnon mine, Butte, Mont.

Cu	40.24
Ag	21.80
Pb	1.46
Zn	12.83
Fe	1.98
S	20.88
	99.19

LÖLLINGITE.

From Teocalli Mountain, Brush Creek, Gunnison County, Colo. Specific gravity, 7.400 at 14.5°, corrected for impurity. Analyzed by W. F. Hillebrand and described in Bulletin 20.

As	71.18
S	.56
Bi	.08
Cu	.39
Fe	22.96
Co	4.37
Ni	.21
	99.75

A doubtful arsenide of nickel and cobalt has also been examined by Hillebrand and described in Proc. Colorado Sci. Soc., vol. 3, pt. 1, p. 46. From the Rose mine, Grant County, N. Mex. Specific gravity, 6.644 at 20°. Probably a mixture. Ni: Co=3:1, approximately.

As	74.04
S	.13
Ag	4.78
Cu	.04
Pb	.03
Fe	.44
Ni, Co	19.52
CaO	.09
MgO	.05
	99.12

ENARGITE.

From the Rarus mine, Butte, Mont. Collected by G. W. Tower. Analysis by W. F. Hillebrand.

Cu	48.67
Fe	.33
Zn	.10
As	17.91
Sb	1.76
S	31.44
Insoluble	.11
	100.32

CUPROBISMUTITE.

New species, discovered by W. F. Hillebrand and described by him in Bulletin 20. Named by Dana. Specific gravity, 6.680 at 15°, corrected for impurities. From the Missouri mine, Halls Valley, Park County, Colo. Analyses, by Hillebrand, of three different samples.

	I.	II.	III.
Bi	60.74	63.36	62.45
Ag	.89	4.09	9.89
Cu	15.96	12.65	6.68
Pb			2.74
Fe	2.13	.59	.10
Zn	.10	.07	.07
S	[a] 19.94	[a] 18.83	17.90
	99.76	99.59	99.83

[a] Calculated.

ZINKENITE.

From the Brobdignag mine, Red Mountain, San Juan County, Colo. Specific gravity, 5.21 at 18°. Analyzed by W. F. Hillebrand and described by him in Bulletin 20.

	I.	II.
Sb	35.00	
As	5.64	5.59
Pb	32.77	32.79
Cu	1.20	
Ag	.23	
Fe	.02	
CaO	.31	
Alkalies	.45	
S	22.50	22.50
Gangue	.59	
	98.71	

WARRENITE.

New species, described by L. G. Eakins in Am. Jour. Sci., 3d ser., vol. 36, 1888, p. 450. From the Domingo mine, Gunnison County, Colo. Occurs in matted, fibrous masses, known locally as "mineral wool." Analysis by Eakins.

Pb	39.33
Sb	36.34
S	21.19
Ag	trace
Fe	1.77
Mn	trace
Insoluble	.52
	99.15

COSALITE.

From the Comstock mine, near Parrott City, La Plata County, Colo. Described by W. F. Hillebrand in Bulletin 20.

Bi	42.93
Ag	8.43
Cu	7.50
Pb	22.49
Fe	.70
Zn	trace
S	17.11
	99.16

FREIESLEBENITE.

From Augusta Mountain, Gunnison County, Colo. Known locally as "mineral wool." Remarkable for its freedom from silver. Analyzed by L. G. Eakins and described by him in Am. Jour. Sci., 3d ser., vol. 36, 1888, p. 452.

Pb	55.52
Sb	25.99
S (calculated)	18.98
Ag	trace
Fe	trace
Zn	trace
	100.49

GUITERMANITE.

New species, discovered by W. F. Hillebrand and described by him in Bulletin 20. From the Zuñi mine, Anvil Mountain, near Silverton, San Juan County, Colo. Forms the matrix of zunyite. Corrected specific gravity, 5.94 at 17.5°. Analyses by Hillebrand.

	I.	II.
Admixed zunyite	1.77	3.82
As	13.40	13.00
Pb	63.60	61.63
Cu	.17	.17
Ag	.02	.02
Fe	.43	.88
S	19.67	19.56
O	----------	.55
	99.06	99.63

III. TELLURIDES.

HESSITE.

From San Sebastian, Jalisco, Mexico. Specific gravity, 8.24 at 26°. Analysis by W. F. Hillebrand.

Ag	61.16
Te	36.11
Pb	1.90
S, Fe, Zn	undet.
	99.17

PETZITE.

From the Norwegian mine, Calaveras County, Cal. Collected by F. L. Ransome. Specific gravity, 8.925 at 23°. Analysis by W. F. Hillebrand. Formula, $Au_2Te.3Ag_2Te$.

Ag	41.87
Au	25.16
Te	33.21
Se	trace
Mo	.08
	100.32

CALAVERITE.

From Cripple Creek, Colo. Collected by R. A. F. Penrose, jr. Analyzed by W. F. Hillebrand and described by him in Bulletin 167.

A. From the Prince Albert mine. Corrected specific gravity, 9.0 at 24°.

B. Raven mine.

C. C. O. D. mine.

	A.	B.	C
Te	57.27	47.69	53.89
Au	38.95	33.93	39.31
Ag	3.21	1.47	.85
Insoluble matter	.33	5.80	.91
Fe_2O_3	.12		
Fe		5.41	1.67
S		[a]6.17	1.58
Mn			[b].23
Ca			.51
Mg			.10
O, F, and soluble SiO_2 by difference			.95
	99.88	100.47	100.00

[a] Calculated from Fe to make FeS_2.

[b] $AsMnO_3$?

MELONITE.

From the Melones mine, Carson Hill, Calaveras County, Cal. Collected by F. L. Ransome. Analyzed by W. F. Hillebrand and described by him in Bulletin 167. Three samples. Specific gravity of B, 7.72 at 22.5°, which is probably too high for the pure $NiTe_2$. Sample C is the purest.

	A.	B.	C.
Te	75.29	77.72	80.75
Ni	15.71	17.16	18.31
Co		.10	
Ag	8.44	5.09	.86
	99.44	100.07	99.92

IV. CHLORIDES AND FLUORIDES.

HALITE.

Rock salt from Salton, Cal. Analysis by E. T. Allen.

NaCl	94.54
KCl	.31
Na_2SO_4	3.53
$CaSO_4 2H_2O$	.79
Moisture	.14
Insoluble residue	.50
	99.81

EMBOLITE.

From Broken Hill, Australia. Analysis by L. G. Eakins.

AgCl	59.97
AgBr	39.22
H_2O	.63
	99.82

CRYOLITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Massive. Pinkish in color. Specific gravity, 2.972 at 24°. Analysis by W. F. Hillebrand.

Al	12.81
Na	32.40
Ca	.28
F	53.55
Fe_2O_3	.40
H_2O	.30
	99.74

PACHNOLITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Compact bluish variety. Specific gravity, 2.980 at 22°.

B. Crystalline coating.

C. Fresh, transparent, crystalline material.

D. Carefully selected crystals. Specific gravity, 2.965 at 17°; 2.962 at 22°.

	A.	B.	C.	D.
Al	11.94	12.93, 12.92	12.14	12.27
Ca	19.32	15.27, 15.17	18.06	18.04
Mg	.13	1.53		
Na	10.43	10.28	10.23	10.25
K		.13		
H_2O	7.87, 7.95	8.64, 8.79	8.10, 8.11	8.05
F			51.33, 51.28	[a] 51.39
			99.86	100.00

[a] By difference.

ELPASOLITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described as a new species by Cross and Hillebrand in Bulletin 20. Incomplete analysis on insufficient material, by W. F. Hillebrand. The fluorine was deduced by calculation on the assumption that the metals are fully combined with it.

Al	11.32
Ca	.72
Mg	.22
K	28.94
Na	9.90
F	46.98
	98.08

GEARKSUTITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

Al	15.20
Ca	22.30
Na	.10
K	.04
H_2O	15.46
F	42.07
	95.17
Oxygen (loss)	4.83
	100.00

PROSOPITE.

Two samples of prosopite have been analyzed by W. F. Hillebrand, as follows:

A. From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Specific gravity, 2.880 at 23°. Mean of four analyses.

B. Pale green, massive variety, from the Dugway mining district, Tooele County, Utah. Specific gravity, 2.87 at 21°. Described by Hillebrand in Bulletin 167.

	A.	B.
Al	22.02	20.08
Ca	17.28	17.55
Mg	.17	trace
K		.12
Na	.48	.32
Cu		.17
F	33.18	28.00
H_2O	13.46	14.24
	86.59	80.48
Oxygen (loss)	13.41	[a] 19.52
	100.00	100.00

[a] Including a little quartz; undetermined.

TYSONITE.

From Cheyenne Mountain, near Pikes Peak, Colorado. Analyzed by W. F. Hillebrand and described by him in Bulletin 167. Corrected specific gravity, 6.14 at 28°.

Ce_2O_3 (includes 0.18 ThO_2?)	42.89
La_2O_3 group (at. wt. 139.7)	39.31
F	28.71
CO_2	.53
CaO	.18
Na_2O	.30
K_2O and Li_2O	traces
Fe_2O_3	.11
	112.03
Less O equivalent to F	12.08
	99.95

V. OXIDES AND HYDROXIDES.

SPINEL.

Variety pleonaste. Separated from a pyroxenite found between South Meadow and Moore creeks, Madison County, Mont. Rock described by Merrill in Proc. U. S. Nat. Mus., vol. 17, p. 659. Specific gravity of spinel, 3.89 at 32°.3. Analysis by L. G. Eakins.

Al_2O_3	62.09
FeO	17.56
MgO	15.61
Cr_2O_3	2.62
Fe_2O_3	2.10
MnO	trace
CaO	.16
SiO_2	.55
	100.69

GAHNITE.

From Gilmore's mica mine, Montgomery County, Md., about 12 miles north of Washington, D. C. Color, bottle-green. Specific gravity, 4.59. Analyzed by T. M. Chatard and described by him in Bulletin 9.

Al_2O_3	55.46
Fe_2O_3	2.77
ZnO	40.07
MgO	.59
CuO	undet.
SiO_2	.57
Ignition	.30
	99.76

MAGNETITE.

From the Gallatin Range, between Middle and Bozeman creeks, near Bozeman, Mont. Analysis by T. M. Chatard.

Insoluble	0.16
Fe_3O_4	96.70
Al_2O_3	.04
MnO	.93
CaO	trace
MgO	.07
TiO_2	2.71
P_2O_5	.012
S	.171
	100.793
Less O equivalent to S	.06
	100.733

CHROMITE.

From Corundum Hill, North Carolina. Analysis by T. M. Chatard. Fe_2O_3 not separately determined.

Cr_2O_3	45.94
FeO	42.90
Al_2O_3	2.51
MnO	.84
NiO, CoO	.16
CaO	1.40
MgO	2.81
CuO	.40
SiO_2	3.20
TiO_2	.36
P_2O_5	.12
	100.64

RUTILE.

From near St. Peters Dome, Pikes Peak district, Colorado. Specific gravity, 4.288 at 19°. Analysis by L. G. Eakins.

TiO_2	94.93
FeO	3.77
SiO_2	1.37
H_2O	.71
	100.78

DIASPORE.

From Mount Robinson, Custer County, Colo. Analysis by L. G. Eakins.

Al_2O_3	83.97
H_2O	15.43
	99.40

BAUXITE.

Two samples from Jacksonville, Calhoun County, Ala. Alkalies, lime, and magnesia not looked for. Analyses by W. F. Hillebrand.

	Red.	White.
Al_2O_3	41.00	48.92
Fe_2O_3	25.25	2.14
H_2O at 100°	.65	.45
H_2O by ignition	20.43	23.41
SiO_2	10.25	21.08
TiO_2	2.53	2.52
P_2O_5	trace	trace
	100.11	98.52

BRUCITE.

From Texas, Lancaster County, Pa. Analysis by E. A. Schneider:

MgO	67.97
MnO	.97
Fe_2O_3	.39
H_2O at 105°	.18
H_2O, ignition	30.63
	100.14

PSILOMELANE.

From a prospect hole on plain south of Round Mountain, Silver Cliff, Colo. Analysis by W. F. Hillebrand. There were strong spectroscopic reactions for strontia and lithia, but these bases were not estimated. A little insoluble gangue is included with the silica.

MnO_2	76.18
MnO	5.71
H_2O below 120°	1.41
H_2O above 120°	3.94
Al_2O_3	1.81
Fe_2O_3	.34
CoO	trace
ZnO	2.80
CaO	.83
MgO	.29
K_2O	3.46
Na_2O	.81
Sb_2O_5	.12
SiO_2	2.30
	100.00

VI. CARBONATES.

DOLOMITE.

A. Dolomite marble, New York Quarry Company, Tuckahoe, Westchester County, N. Y. Analysis by W. F. Hillebrand.

B. Dolomite marble, Cockeysville, Md. Analysis by J. E. Whitfield.

C. Same as B. Analysis by E. A. Schneider. Another sample.

D. Dolomite marble, Webster, Mass. Analysis by H. N. Stokes.

E. Pink, crystallized dolomite, Joplin, Mo. Analysis by E. T. Allen.

	A.	B.	C.	D.	E.
Insoluble	0.62		5.57		
SiO_2	.71	0.44		1.01	
Al_2O_3		1.22	.40	.17	
Fe_2O_3	.21			none	
FeO		trace		.37	0.90
MnO				.08	.06
MgO	20.71	20.87	20.30	21.35	19.65
CaO	30.68	30.73	29.08	30.82	32.05
CO_2	46.66	45.85	44.26	45.84	46.82
H_2O	.16	1.22		.09	.48
K_2O				.10	
Na_2O				.01	
P_2O_5				.06	
TiO_2				trace	
S				trace	
	99.75	100.33	99.61	99.90	99.96

SMITHSONITE.

From Marion County, Ark. Bright yellow variety, known locally as "turkey-fat ore." Analysis by H. N. Stokes.

SiO_2	0.06
ZnO	64.12
CdO	.63
CdS	.25
CO_2	34.68
CuO	trace
FeO	.14
CaO	.38
	100.26

BASTNÄSITE.

Associated with the tysonite of Cheyenne Mountain, near Pikes Peak, Colorado. Specific gravity, 5.12 at 27°. Analyzed by W. F. Hillebrand and described by him in Bulletin 167.

Ce_2O_3	[a] 37.71
La_2O_3 group	36.29
Fe_2O_3	.23
CO_2	20.03
Na_2O	.18
K_2O, Li_2O	traces
H_2O	.08
F	7.83
	102.34
O equivalent to F	3.30
	99.04

URAO.

Deposited from the waters of Owens Lake, California. Analyses by T. M. Chatard. Described by Chatard in Bulletin 60. Five samples analyzed, as follows:

A. The best material. Specific gravity, 2.1473 at 21.7°.
B. Crude urao.
C. Urao deposited upon a grass root.
D. From a small lagoon.
E. From a vat dug on the beach of Owens Lake.

	A.	B.	C.	D.	E.
Insoluble, inorganic	0.02	0.22	2.92	0.40	4.10
Insoluble, organic			.14	.12	.27
SiO_2		.10	.05	.09	.04
Cl	.19	1.57	2.73	.21	1.83
SO_3	.70	.79	.76	.63	.84
CO_2	38.13	37.00	35.24	37.50	35.10
Na_2O	41.00	41.26	40.22	40.08	39.36
K_2O				trace	
CaO				.06	
MgO				.02	
H_2O	20.07	19.62	18.31	19.94	18.58
	100.11	100.56	100.37	99.05	100.12
O equivalent to Cl	.04	.35	.61	.05	.41
	100.07	100.21	99.76	99.00	99.71

[a] Includes 0.10 ThO_2.

VII. SILICATES.

PETALITE.

From Peru, Me., associated with spodumene. Analysis by F. W. Clarke.

Ignition	1.03
SiO_2	77.29
Al_2O_3	16.95
Fe_2O_3	trace
MnO	trace
Li_2O	2.62
Na_2O	2.39
K_2O	trace
	100.28

ORTHOCLASE AND MICROCLINE.

A. Orthoclase from Silver City, Idaho. Occurs as a gangue mineral. Partial analysis by W. F. Hillebrand.

B. Orthoclase from Mitchell County, N. C. Large cleavage mass. Analysis by E. T. Allen.

C. Feldspar crystal from the nevadite of Chalk Mountain, Summit County, Colo. Analysis by W. F. Hillebrand.

D. Pink orthoclase crystals, from gray porphyry, Johnson Gulch, near Leadville, Colo. Described by Cross in Monograph XII, Appendix A. Analysis by W. F. Hillebrand.

E. Feldspar separated from gabbro. East side of North Fowl Lake, Minnesota. Analysis by W. F. Hillebrand.

F. Feldspar from the elæolite-syenite of Litchfield, Me. Described by Bayley in Bulletin 150, p. 201. Analysis by W. H. Melville.

	A.	B.	C.	D.	E.	F.
SiO_2	66.28	65.09	65.04	62.22	62.71	65.14
TiO_2					trace	
Al_2O_3	17.93	18.95	20.40	20.33	19.20	18.19
Fe_2O_3		.36			1.08	
FeO					.93	.25
MnO					trace	
CaO		.42	.79	2.95	.44	.33
SrO					trace	
MgO		none	none		.81	.16
Na_2O	.25	2.29	4.11	3.45	2.96	1.68
K_2O	15.12	12.95	9.74	8.31	10.41	14.14
Li_2O			trace		none	
H_2O at 100°			.29	1.90	.23	.17
H_2O above 100°					.92	
	99.58	100.06	100.37	99.16	99.69	100.06

G. Flesh-colored microcline from the pegmatite of Jones Falls, Baltimore, Md.

H. Greenish microcline, same locality as G. G and H described by S. L. Powell in Johns Hopkins Univ. Circular, vol. 12, p. 49. Analyses by W. F. Hillebrand.

I. Anorthoclase from the elæolite-syenite of Peaked Butte, Crazy Mountains, Montana. See Wolff and Tarr in Bull. Mus. Comp. Zoöl., Harvard Coll., vol. 16, No. 12, 1893. Analysis by W. F. Hillebrand.

J. Anorthoclase from red soda-granite, Pigeon Point, Minnesota. Described by Bayley in Bulletin 109. Analysis by J. E. Whitfield.

K. Anorthoclase from keratophyre, Marblehead Neck, Massachusetts. Described by Sears, Bull. Mus. Comp. Zoöl., Harvard Coll., vol. 16, No. 9, 1893. Analysis by T. M. Chatard.

	G.	H.	I.	J.	K.
SiO_2	65.06	68.48	62.31	65.00	65.66
Al_2O_3	18.41	16.11	22.63	18.22	20.05
Fe_2O_3	trace	.20		2.64	trace
FeO		.17			trace
MnO					.13
MgO	.04	.03		.06	.18
CaO	.26	.23	.63	1.06	.67
SrO	trace	trace	.57		
BaO	.13	.05	.77		
K_2O	14.30	12.99	4.79	4.18	6.56
Na_2O	1.60	1.27	7.68	8.40	6.98
Li_2O	trace	trace			
H_2O at 100°	.04	.06	.16	.46	.04
H_2O above 100°	.26	.26	.72		.37
	100.10	99.85	100.26	100.02	100.64

ALBITE.

A. From feldspathic schist, central shaft of the Hoosac Tunnel, Berkshire County, Mass. Described by Wolff in Monograph XXIII, pp. 60–187. Analysis by R. B. Riggs.

B, C. From the porphyritic mica-schist of Greylock Mountain, Massachusetts. Described by Wolff, loc. cit. Analyses by R. B. Riggs.

D. From the clæolite-syenite of Litchfield, Me. Described by Bayley in Bulletin 150, p. 201. Specific gravity, 2.622. Analysis by W. H. Melville.

E. From the pegmatite of Jones Falls, Baltimore, Md. Described by S. L. Powell in Johns Hopkins Univ. Circular, vol. 12, p. 49. Analysis by W. F. Hillebrand.

	A.	B.	C.	D.	E.
SiO_2	69.69	68.08	67.83	68.28	63.72
Al_2O_3	18.60	20.11	19.92	19.62	22.26
Fe_2O_3					
FeO				.23	
MgO	.20	(?)	(?)	.09	.06
CaO	trace	trace	trace	.31	3.58
SrO					trace
Na_2O	10.28	11.00	11.65	10.81	8.98
K_2O	.40	.36	.25	.39	.76
Li_2O					trace
MnO		trace	trace		
H_2O below 100°	.42	.31	.12	.09	.09
H_2O above 100°					.43
	99.59	99.86	99.77	99.82	99.88

ANORTHITE.

A. From Raymond, Me. Associated with idocrase, garnet, pyroxene, and scapolite. Analysis by W. H. Melville.

B. From Phippsburg, Me. Occurrence similar to A. Incomplete analysis by George Steiger.

C. Separated from "hyperite changing to diorite," near Whitaker's ore pit, Wilmington, Del. Described by Chester in Bulletin 59. Analysis by R. B. Riggs.

	A.	B.	C.
SiO_2	43.13	45.62	44.09
Al_2O_3	30.95	35.29	35.41
Fe_2O_3	1.04		.51
FeO	trace		
MnO	trace		
CaO	19.71	17.31	18.47
MgO	.31		none
K_2O	1.29		.19
Na_2O	.69		.99
Li_2O	trace		
H_2O at 100°	.22		.35
H_2O above 100°	2.80		
	100.14	98.22	100.01

SODA-LIME FELDSPARS.

A. Transparent oligoclase, from Bakersville, N. C. Analysis by F. W. Clarke.

B. Feldspar separated from porphyrite; Sugar Loaf, northwest of Elk Mountain, Tenmile district, Summit County, Colo. Analysis by W. F. Hillebrand. Much altered.

C. Feldspar separated from andesite; mesa northwest of Parkdale, Colo. Analysis by W. F. Hillebrand.

D. Feldspar separated from gabbro; Brandywine Creek, Wilmington, Del. Specific gravity, 2.592–2.877. Described by Chester in Bulletin 59. Analysis by R. B. Riggs.

E. Feldspar separated from the gabbro of Ashland County, Wis. Analysis by W. F. Hillebrand.

F. Feldspar separated from diabase; near SE. corner of sec. 13, T. 47 N., R. 46 W., Michigan. Described by Van Hise in Monograph XIX. Analysis by T. M. Chatard.

	A.	B.	C.	D.	E.	F.
SiO_2	62.92	62.96	63.02	70.37	53.30	51.18
TiO_2					trace	
Al_2O_3	25.32	21.51	23.05	18.36	29.03	27.00
Fe_2O_3	trace			.58	.55	3.19
FeO		.32		undet.	.23	undet.
CaO	4.03	4.00	3.39	5.08	11.40	11.70
SrO		.13	trace		trace	
BaO					trace	
MgO		.30	trace	.04	.13	1.92
MnO	trace			trace	none	.17
K_2O	.96	1.60	3.92	.63	.40	.41
Na_2O	6.18	6.15	6.76	4.32	4.87	3.48
Li_2O		trace	none		none	
P_2O_5					trace	
H_2O	.25	2.78	.26	.45	.23	1.19
	99.66	99.75	100.40	99.83	100.14	100.24

G, H. Feldspars separated from olivine-diabase; NE. ¼ sec. 13, T. 45 N., R. 1 W., Wisconsin. See Van Hise, Monograph XIX. Analyses by T. M. Chatard.

I. Feldspar from gabbro; southern half of sec. 14, T. 44 N., R. 4 W., Wisconsin. See Van Hise, loc. cit. Analysis by T. M. Chatard.

The following feldspars were separated from Minnesota gabbros for W. S. Bayley and analyzed by W. F. Hillebrand:

J. From average gabbro, south quarter post, sec. 35, T. 61 N., R. 12 W.

K. From gabbro, NW. ¼ of SE. ¼ sec. 23, T. 62 N., R. 10.

L. From gabbro, center of sec. 25, T. 64 N., R. 8.

M. From gabbro, Duluth and Iron Range Railroad.

N. O. Two feldspars separated from the amphibolite of Palmer Center, Mass. Analyses by W. F. Hillebrand. Specific gravity of N, 2.667 at 24°; of O, 2.677 at 22°. In N, calculation gives about 7.4 and in O 7.6 per cent of admixed quartz.

	G.	H.	I.	J.	K.
SiO_2	61.65	56.15	51.99	51.89	52.50
Al_2O_3	19.91	26.05	29.32	29.68	30.15
Fe_2O_3	2.28	1.98	1.23	.32	.47
FeO	undet.	undet.		.37	.15
MnO	trace	.13	trace	.....	.....
CaO	4.12	8.70	12.60	12.62	12.82
MgO	.61	.54	.63	.38	.10
Na_2O	4.74	4.79	2.91	3.87	3.72
K_2O	5.72	1.56	.28	.50	.53
H_2O at 100°	.95	.13	.03	.07	.25
H_2O above 100°		.64	.54	.39	
TiO_2	.....	.....	.....	.....	trace
	99.98	100.67	99.53	100.09	100.69

	L.	M.	N.	O.
SiO_2	52.61	53.45	62.91	60.90
Al_2O_3	29.80	29.77	23.37	24.97
Fe_2O_3	.57	.33	trace	trace
FeO	.23	.15	.....	.....
CaO	12.25	11.33	5.83	7.85
MgO	.20	.11	.....	.....
Na_2O	3.80	4.33	7.78	6.26
K_2O	.53	.68	.20	.16
H_2O at 100°	.29	.23	.42	.48
H_2O above 100°				
TiO_2	trace	trace	trace	trace
MnO	trace	.....	.....	.....
	100.28	100.38	100.51	100.62

LEUCITE.

From Mount Vesuvius. A fine crystal. Analysis by George Steiger.

SiO_2	55.40
Al_2O_3	23.69
CaO	.16
K_2O	19.54
Na_2O	1.25
H_2O	.24
	100.28

ENSTATITE.

A. Enstatite from Granville, Mass. Slightly altered. Described by Emerson in Monograph XXIX. Analysis by W. F. Hillebrand.

B. Enstatite separated from the San Emigdio meteorite, found in San Bernardino County, Cal. Analysis by J. E. Whitfield.

C. White, fibrous mineral, near enstatite, from seams in chrysolite rock, Corundum Hill, North Carolina.

D. Altered enstatite, Corundum Hill. Analyses C and D by T. M. Chatard. (See Bulletin 42.) Specific gravity, 2.872.

E. Bronzite separated from the websterite of Hebbville, Md. Described by Williams in Am. Geologist, vol. 6, p. 35. Analysis by T. M. Chatard.

	A.	B.	C.	D.	E.
SiO_2	54.04	54.42	56.39	56.58	54.53
TiO_2	none	.....	none	none	undet.
Al_2O_3	.52	.....	2.31	1.74	1.93
Fe_2O_3	1.51	.....	.16	1.89	1.70
FeO	3.90	14.03	1.96	3.67	8.92
MnO	.11	.....	.....	.21	.28
NiO	.23	.....	.....	.....	.....
Cr_2O_3	.14	.....	.....	.24	.30
MgO	34.40	29.11	34.57	30.34	29.51
CaO	none	2.46	.04	.59	2.25
Alkalies	.08	.....	.....	.17	.....
P_2O_5	none	.....	.....	.....	trace
CO_2	1.32	.....	.....	.....	.....
H_2O at 100°	.70	.....	4.32	4.55	1.14
H_2O above 100°	3.07	.....			
	100.02	100.02	99.75	99.98	100.56

HYPERSTHENE.

A. From the basalt of Mount Thielsen, Oregon. Incomplete analysis by T. M. Chatard.

B. From gabbro, SE. ¼ sec. 20, T. 65 N., R. 4 W., Minnesota. Described by Bayley in Jour. Geol., vol. 3, p. 1. Analysis by E. A. Schneider.

C. From the augite-andesite of the Tokajer-Berg, Hungary. Analysis by W. F. Hillebrand. Specific gravity, 3.495 at 25°.

D, E, F. Three specimens separated from the hypersthene-andesite of the Buffalo Peaks, Colorado. Described by Cross in Bulletin 1. Analyses by W. F. Hillebrand. In D and E alkalies were disregarded. In E and F all the iron is given as FeO. Specific gravity of F, 3.307 at 23°.

	A.	B.	C.	D.	E.	F.
SiO_2	53.31	48.44	51.44	51.70	51.16	50.04
TiO_2	.....	undet.	.73	.....	.....	.....
Al_2O_3	5.99	7.91	.60	1.72	2.15	2.91
Fe_2O_3	}	.33	2.28	.30	}	}
FeO	} 13.43	20.88	20.77	18.00	} 18.36	} 17.81
MnO	.....	.92	.88	.36	.36	.12
MgO	21.69	19.35	19.93	25.09	24.25	21.74
CaO	3.69	1.44	3.80	2.87	3.81	6.70
Na_2O	.....	.....	.....	.....	.....	.27
H_2O at 100°	.....	.08	.....	.....	.....	.....
H_2O above 100°	.....	none	.....	.....	.....	.....
	98.11	99.35	100.43	100.04	100.09	99.59

PYROXENES.

A. Diopside separated from the websterite of Hebbville, Md. Described by G. H. Williams, Am. Geologist, vol. 6, p. 35. Analysis by T. M. Chatard.

B. Diopside from the leucite rocks of the Leucite Hills, Wyoming. Described by Cross, Am. Jour. Sci., 4th ser., vol. 4, p. 115. Specific gravity, 3.290 at 20°. Analysis by W. F. Hillebrand.

C. Pyroxene from Moriah, N. Y. The source of associated serpentine. Analysis by Charles Catlett.

D. Dark-gray pyroxene, Montville, N. J. The source of associated serpentine. Analysis by Charles Catlett.

E. Diallage from the gabbro of Ashland County, Wis. Analysis by W. F. Hillebrand.

F. Jeffersonite from Franklin Furnace, N. J. Analyzed by W. F. Hillebrand and described by him in Bulletin 167.

	A.	B.	C.	D.	E.	F.
SiO_2	51.80	50.86	55.36	51.45	49.80	51.70
TiO_2	.13	3.03	.....	.....	1.29	.....
Al_2O_3	2.21	.....	.22	2.94	2.86	.36
Cr_2O_3	.51	.....	none	.....	.....	.....
Fe_2O_3	1.29	1.19	.18	1.06	2.48	.37
FeO	3.50	1.82	.57	.96	10.82	.....
MnO	trace	.03	trace	trace	.37	7.43
ZnO	.....	.....	.....	.....	.....	3.31
MgO	17.76	17.42	19.53	18.43	15.33	12.57
CaO	20.99	23.32	24.48	24.02	16.50	23.68
Na_2O	undet.	.76	.....	.....	.51	.12
K_2O	undet.	.42	.....	.....	.12	trace
P_2O_5	trace	.....	.....	.....	trace	.....
H_2O	.65	.31	.....	1.08	.33	.65
	98.84	99.16	100.34	99.94	100.41	100.19

G. Augite from nepheline-basalt, Black Mountain, Uvalde quadrangle, Texas. Violet colored. Analysis by W. F. Hillebrand.

H. Augite from dolerite dike, near Valmont, Colo. See Cross, Monograph XXVII. Analysis by L. G. Eakins.

I. Augite from tinguaite, Two Buttes, Colo. Specific gravity, 3.43 at 28°. Analysis by W. F. Hillebrand.

J. Pyroxene from syenitic lamprophyre, Two Buttes, Colo. Specific gravity, 3.45 at 25°. Analysis by W. F. Hillebrand.

K. Augite from granite, north end of Blue Mountains, Silver Cliff, Colo. Specific gravity, 3.225 at 18°. Analysis by L. G. Eakins.

L. Augite from the Golden King dike, Silver Cliff, Colo. Specific gravity, 3.281 at 13°. Analysis by L. G. Eakins.

M. Pyroxene from norite, dike east of Sugar Loaf, Boulder County, Colo. Analysis by L. G. Eakins.

	G.	H.	I.	J.	K.	L.	M.
SiO_2	45.23	49.10	47.54	51.27	48.72	54.87	47.32
TiO_2	4.28	.....	3.00	.70	.....	.....	.....
ZrO_2	.....	.....	none	none	.....	.....	.....
Al_2O_3	7.73	7.95	4.14	3.05	9.27	6.34	6.37
Cr_2O_3	.....	.....	trace?	none	.....	.....	.....
Fe_2O_3	2.95	.....	5.64	3.08	3.77	2.88	2.56
FeO	4.07	8.30	6.42	4.34	6.34	4.61	14.40
MnO	.07	.....	.36	.28	.34	.14	.....
MgO	12.25	12.37	10.05	14.21	14.67	14.47	13.43
CaO	23.37	22.54	21.57	22.58	16.79	15.87	16.08
Na_2O	.47	trace	1.38	.67	.19	.28	.....
K_2O	.12	trace	.12	.06	.....	.....	.....
Li_2O	trace	.....	trace	.....	.....	.....	.....
BaO	none	.....	none	none	.....	.....	.....
SrO	none	.....	none	none	.....	.....	.....
NiO	.05	.....	trace	.03	.....	.....	.....
P_2O_5	none	.....	.....	.....	.....	.....	.....
H_2O	.37	.....	undet.	undet.	.18	.31	.....
	100.96	100.26	100.22	100.27	100.27	99.77	100.16

N. Pyroxene from Italian Mountain, Gunnison County, Colo. Associated with idocrase, scapolite, garnet, epidote, etc. Analysis by L. G. Eakins. Specific gravity, 3.312 at 16.7°.

O. Augite from basalt, 6 miles northeast of Grants, Mount Taylor region, New Mexico. Analysis by T. M. Chatard.

P. Pyroxene from peridotite, east of Fort Ellis, Mont. Partial analysis by F. W. Clarke.

Q. Pyroxene from basalt, east side of Bozeman Creek, 2½ miles southeast of Bozeman, Mont. Described by Merrill, Proc. U. S. Nat. Mus., vol. 17, p. 637. Analysis by L. G. Eakins.

	N.	O.	P.	Q.
SiO_2	47.53	47.06	51.95	52.50
TiO_2	.....	1.82	.....	.....
Al_2O_3	9.88	7.77	4.21	2.26
Cr_2O_3	.....	trace	.....	1.07
Fe_2O_3	1.79	1.30	.....	2.05
FeO	.91	8.15	5.90	2.47
MgO	trace	.20	undet.	trace
NiO.CoO	.....	trace	.....	.....
MgO	14.43	13.52	13.81	17.11
CaO	25.46	19.33	23.32	21.70
Na_2O	trace	.33	.....	.35
K_2O	.....	.11	.....	.07
P_2O_5	.....	.06	.....	.....
H_2O	.30	.20	undet.	.64
	100.39	99.85	99.19	100.22

ÆGIRITE.

From Magnet Cove, Arkansas. Analysis by George Steiger.

SiO_2	50.45
Al_2O_3	2.76
Fe_2O_3	23.42
FeO	5.26
MnO	.10
MgO	1.48
CaO	5.92
Na_2O	9.84
K_2O	.24
H_2O at 100°	.15
H_2O above 100°	.40
	100.02

JADEITE.

The following analyses of jadeite, all by F. W. Clarke, were discussed by Clarke and Merrill in the Proceedings of the United States National Museum for 1888. They all represent worked material.

A. Light-colored bead, mottled with emerald green, from State of Oaxaca, Mexico. Specific gravity, 3.007, determined by William Hallock.

B. Carved head, light green, from Zaachita, Oaxaca. Specific gravity, 3.190, Hallock.

C. Fragment from Sardinal, Costa Rica; pale green, translucent. Specific gravity, 3.32, Clarke.

D. Fragment from Culebra, Costa Rica; light green, granular, opaque; quite impure. Specific gravity, 3.27, Clarke.

	A.	B.	C.	D.
SiO_2	58.88	58.18	59.18	58.33
Al_2O_3	25.93	23.53	22.96	21.63
Cr_2O_3	.12			
Fe_2O_3	}	}	}	1.71
FeO	.24	1.67	1.87	.73
MgO	.36	1.72	.67	3.09
CaO	.40	2.35	1.52	4.92
Na_2O	11.64	11.81	12.71	8.13
K_2O	.63	.77	trace	.22
Ignition	1.81	.53	.90	.93
	100.01	100.56	99.81	99.69

WOLLASTONITE.

Compact variety, from Diana, N. Y. Partial analysis by E. A. Schneider:

SiO_2	50.05
Al_2O_3, Fe_2O_3	1.13
CaO	47.10
MgO	.09
H_2O	.45
	98.82

PECTOLITE.

A. Stone hammer, at first supposed to be jade, collected among the Eskimo of Point Barrow, Alaska. Analyzed by F. W. Clarke, and described by him in Bulletin 9. Pale apple-green, tough, compact, highly polished. Specific gravity, 2.873.

B. Radiated pectolite from Bergen Hill, New Jersey. Analyzed by E. A. Schneider.

C. Another sample from Bergen Hill. Analysis by George Steiger.

	A.	B.	C.
SiO_2	53.94	53.11	53.34
$Al_2O_3+Fe_2O_3$	.58	.40	.33
MnO		.81	.45
CaO	32.21	33.88	33.23
MgO	1.43		
Na_2O	8.57	8.62	9.11
CO_2			.67
H_2O at 105°	4.09	.04	.27
H_2O, 250°–300°		.14	2.70
H_2O, red heat		2.86	
	100.82	99.86	100.10

AMPHIBOLE.

A. Tremolite, pseudomorphous after sahlite; northeast slope of Canaan Mountain, Connecticut. Analysis by W. F. Hillebrand.

B. Tremolite, found in the serpentine of Easton, Pa. Analysis by L. G. Eakins.

C. Actinolite (?), Corundum Hill, North Carolina. Specific gravity, 3.062. Analyzed by T. M. Chatard and described by him in Bulletin 42.

D. Nephrite, New Zealand. Fragment from a dark-green bowlder. Analysis by F. W. Clarke.

E. Nephrite, Robenhausen, Lake Pfäffikon, Switzerland. Part of a green, compact, highly polished jade implement. Specific gravity, 3.015; determined by William Hallock. Analysis by F. W. Clarke.

	A.	B.	C.	D.	E.
SiO_2	57.97	58.27	55.23	56.73	56.87
TiO_2	none	.....	none	.....	.....
Al_2O_3	.09	.33	3.04	3.22	1.50
Cr_2O_3	.....	.....	.19	.....	.....
Fe_2O_3	.11	trace	1.88	}	
FeO	.18	.....	2.51	} 5.96	6.33
MnO	trace	.08	.26	trace	trace
NiO, CoO	.....	.....	trace	.....	.....
CaO	15.05	11.90	13.36	13.24	13.45
SrO	trace	.....	.....	.....	.....
MgO	22.45	25.93	22.31	19.42	21.06
K_2O	.12	.42	} .58	undet.	undet.
Na_2O	.20	1.25	}	undet.	undet.
H_2O at 100°	.03	} 1.22	.04	} .83	} .63
H_2O above 100°	2.57	}	.52	}	}
CO_2	1.69	.....	.....	.....	.....
	100.46	99.40	99.92	99.40	99.84

F. Dark-green nephrite implement, from the Eskimo of Point Barrow, Alaska. Specific gravity, 3.012. Analysis by F. W. Clarke.

G. Nephrite adze, Point Barrow. Nearly black, with grayish-green patches. Specific gravity, 2.922, Hallock. Analysis by F. W. Clarke.

H. Nephrite adze, Cape Prince of Wales, Alaska. Dark green, laminated in two shades, opaque. Specific gravity, 2.989, Hallock. Analysis by F. W. Clarke.

I. Worked nephrite, St. Michael, Alaska. Dull apple green, fairly uniform in tint, semitranslucent at edges. Specific gravity, 3.006, Hallock. Analysis by F. W. Clarke.

J. Jade implement, Diomede Island, Alaska. Dark green, laminated in two shades, opaque. Specific gravity, 3.010, Hallock. Analysis by F. W. Clarke.

	F.	G.	H.	I.	J.
SiO_2	57.01	57.11	56.01	56.12	55.08
Al_2O_3	.42	2.57	1.98	.63	1.01
FeO	6.95	5.15	6.31	7.45	7.67
CaO	12.75	11.54	12.54	12.72	13.35
MgO	21.36	21.38	21.57	20.92	19.96
MnO	.....	trace	trace	trace	trace
Ignition	1.41	2.06	1.91	1.42	2.03
Alkalies	undet.	undet.	undet.	undet.	undet.
	99.90	99.81	100.35	99.26	100.10

K, L, M, N. Four samples of nephrite, found in situ by Lieutenant Stoney, U. S. Navy, near the Kowak River, Alaska. K, greenish gray, splintery-lamellar. L, like K, but more granular. M, paler, nearly white, closer grained. N, brownish, highly foliated. Analyses by F. W. Clarke. Ferrous iron determinations by R. B. Riggs. O, Nephrite from Jordansmühl, Silesia; analysis by George Steiger; typical material from an old locality. For details concerning nephrites D to N, see the memoir by Clarke and Merrill in Proc. U. S. Nat. Mus. for 1888.

	K.	L.	M.	N.	O.
SiO_2	58.11	55.87	56.85	57.38	56.39
TiO_2					none
Al_2O_3	.24	2.07	.88	.19	1.63
Fe_2O_3	5.44	5.79	4.33	4.43	1.72
FeO	.38	.38	1.45	1.25	3.70
MnO	trace	trace	trace	trace	.26
NiO					.13
CaO	12.01	12.43	13.09	12.14	7.92
MgO	21.97	21.62	21.56	22.71	24.63
Alkalies	undet.	undet.	undet.	undet.	none
P_2O_5					trace
H_2O at 100°	1.78	1.38	1.76	1.73	.65
H_2O above 100°					3.42
	99.93	99.54	99.92	99.83	100.45

P. Brown hornblende, Pierrepont, N. Y. Analysis by T. M. Chatard.

Q. Hornblende separated from gabbro, east shaft of waterworks extension, Washington, D. C. Analysis by R. B. Riggs.

R. Amphibole from the serpentine of Montville, N. J. Analysis by L. G. Eakins.

S. Hornblende separation, from south of soapstone quarry, Warwick, Mass. Analysis by E. A. Schneider.

T. Hornblende from amphibolite dike, Palmer Center, Mass. Specific gravity, 3.220 at 31.5°. Analysis by W. F. Hillebrand.

U. Hornblende from amphibolite bed, same locality and analyst. Specific gravity, 3.217 at 29°.

	P.	Q.	R.	S.	T.	U.
SiO_2	56.44	52.42	43.31	47.86	43.11	44.09
TiO_2	.11	.....	.....	[a].63	1.32	1.73
Al_2O_3	1.77	3.15	17.41	14.09	11.10	10.68
V_2O_3	.....	.....	.....	.....	.07	undet.
Cr_2O_3	.....	.....	.....	.....	trace	trace
Fe_2O_3	.84	3.60	.71	.33	4.97	2.72
FeO	.73	8.36	.59	13.41	13.04	12.96
MnO	.11	.11	.14	.14	.43	.32
NiO	.....	.....	.....	.....	trace	trace
CaO	11.83	14.33	12.84	.57	11.76	11.58
MgO	22.98	15.85	19.39	19.89	9.35	10.75
K_2O	.75	.12	1.36	.06	1.27	.88
Na_2O	2.13	1.16	2.23	.93	1.18	1.19
H_2O at 100°	.05	1.25	1.17	none	.16	.21
H_2O above 100°	2.41			2.46	1.92	1.91
P_2O_5	trace	.....	.....	.05	.10	.10
	100.15	100.35	99.15	100.42	99.78	99.12

[a] Admixed rutile.

V. Hornblende near barkevikite. Separated from the sodalite-syenite of Square Butte, Highwood Mountains, Montana. Described by Lindgren in Am. Jour. Sci., 3d ser., vol. 45, p. 286. Analysis by W. H. Melville.

W. Amphibole separated from quartz-diorite, south of Table Mountain, on ridge between Butte and Plumas counties, Cal. Described by Turner in Seventeenth Annual Report, Part I, p. 521. Analysis by William Valentine. Chromium determination by Hillebrand.

X. Amphibole separated from amphibole gabbro, Beaver Creek, Big Trees quadrangle, California. Analysis by William Valentine. See Bulletin 168, p. 206.

Y. Amphibole separated from quartz-monzonite, Tioga road, southeast of Mount Hoffman, Mariposa County, Cal. Specific gravity, 3.203 at 21.5.° Analysis by W. F. Hillebrand. See Bulletin 168, p. 208.

Z. Amphibole separated from the granite of Butte, Mont. Incomplete analysis for lack of material. Analysis by H. N. Stokes.

	V.	W.	X.	Y.	Z.
SiO_2	38.41	50.08	46.08	47.49	45.73
TiO_2	.....	.76	.77	1.21	1.43
Al_2O_3	17.65	7.97	10.56	7.07	6.77
V_2O_3	.....	.....	.....	.04	.....
Cr_2O_3	.....	.16	.....	none	none
Fe_2O_3	3.75	2.69	2.81	4.88	4.94
FeO	21.75	6.71	8.30	10.69	10.39
MnO	.15	.49	.15	.51	.54
NiO	trace	.....	.....	.02	.....
CaO	10.52	11.21	12.64	11.92	11.25
MgO	2.54	16.31	14.40	13.06	12.32
Na_2O	2.95	1.22	1.62	.75	.77
K_2O	1.95	.46	.34	.49	1.22
Li_2O	.....	.....	none	trace	trace
H_2O at 100°	.....	.....	.17	.....	.49
H_2O above 100°	.24	1.40	1.97	1.86	2.29
P_2O_5	.....	trace	.18	none	.35
F	.....	undet.	none	.06	.28
	99.91	99.46	99.99	100.05	98.77
O equivalent to F	.....	.....	.....	.02	.12
	.....	.....	.....	100.03	98.65

BERYL.

A. White beryl from the tin mine at Winslow, Me. Opaque, milky. associated with mica, fluorite, calcite, tinstone, etc. Specific gravity, 2.707 at 27°. Analysis by W. F. Hillebrand.

B. Green beryl from near Home post-office in eastern Tennessee. Analysis by F. W. Clarke.

	A.	B.
SiO_2	65.21	65.39
TiO_2	trace	----
Al_2O_3	18.50	19.10
Fe_2O_3	.33	
FeO		----
GlO	13.03	13.35
K_2O. Cs_2O	.14	----
Na_2O	.87	----
Li_2O	.16	----
MgO	.09	----
H_2O	1.80	1.76
	100.13	99.60

NEPHELITE.

A. Elæolite from Litchfield, Me. Dark-gray cleavable masses, of greasy luster. Described by F. W. Clarke in Bulletin 42.

B. Another sample from Litchfield. Analysis by George Steiger.

C. Nephelite extracted by solution from the elæolite-syenite of Red Hill, N. H. Described by Bayley in Bull. Geol. Soc. America, vol. 3, p. 231. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	43.74	45.91	45.31
Al_2O_3	34.48	31.14	32.67
Fe_2O_3	----	.34	----
FeO	----	.23	----
MgO	----	----	.16
CaO	trace	.33	2.00
Na_2O	16.62	14.60	12.60
K_2O	4.55	5.60	5.70
H_2O at 100°	.86	.47	----
H_2O above 100°		.93	1.56
CO_2	----	.40	----
	100.25	99.95	100.00

CANCRINITE.

All from Litchfield, Me. See description by Clarke in Bulletin 42.

A. Pale yellow, granular.

B. Bright orange-yellow, cleavable, transparent in thin fragments.

C. Dingy pale yellow, otherwise like B.

D. Average yellow sample.

E. Flesh-colored, cleavable mixture of elæolite and cancrinite. Analysis D by George Steiger; the others by F. W. Clarke. CO_2 determinations in A, B, C, E by R. B. Riggs.

	A.	B.	C.	D.	E.
SiO_2	37.22	36.29	35.88	36.19	38.93
Al_2O_3	28.32	30.12	29.45	29.24	32.52
Fe_2O_3	trace	trace	trace	trace	.....
MnO	trace	trace	trace	.....	trace
CaO	4.40	4.27	5.12	4.72	2.47
MgO	.07	.....	.....	.....	none
Na_2O	19.43	19.56	19.33	19.20	17.02
K_2O	.18	.18	.09	.14	3.23
H_2O	3.86	2.98	3.79	4.15	2.83
CO_2	6.22	6.96	6.50	6.11	2.95
	99.70	100.36	100.11	99.75	99.95

SODALITE.

A. Blue sodalite, from Litchfield, Me. Analysis by F. W. Clarke. See description in Bulletin 42.

B. Blue sodalite, from Ice River, near Kicking Horse Pass, British Columbia. Analysis by George Steiger.

C. Sodalite separated from the sodalite-syenite of Square Butte, Highwood Mountains, Montana. See Lindgren in Am. Jour. Sci., 3d ser., vol. 45, p. 286. Specific gravity, 2.265. Analysis by W. H. Melville.

	A.	B.	C.
SiO_2	37.33	39.06	41.56
Al_2O_3	31.87	30.09	29.48
Fe_2O_3		.31	
FeO			.49
MgO			.15
CaO		.18	.49
Na_2O	24.56	22.60	19.21
K_2O	.10	1.14	.91
H_2O at 100°	1.07	.17	.45
H_2O above 100°		.79	3.73
Cl	6.83	6.12	4.79
	101.76	101.06	101.36
O equivalent to Cl	1.54	1.39	1.08
	100.22	99.67	100.18

ZUNYITE.

From the Zuñi mine, Anvil Mountain, near Silverton, Colo. Analyzed by W. F. Hillebrand, and described by him as a new species in Bulletin 20. Specific gravity, 2.875 at 15°.

SiO_2	24.33
Fe_2O_3	.20
Al_2O_3	57.88
K_2O	.10
Na_2O	.24
Li_2O	trace
H_2O	10.89
P_2O_5	.60
F	5.61
Cl	2.91
	102.76
O equivalent to F and Cl	3.02
	99.74

GARNET.

A. Grossularite. Large waterworn pebble, pale green, very compact. At first, thought to be jade. From Eltoro, 40 miles south of Los Angeles, Cal. Described by Clarke in Am. Jour. Sci., 3d ser., vol. 50, p. 76. Analysis by George Steiger. Specific gravity, 3.485.

B, C, D. Three samples of garnet from Italian Mountain, Gunnison County, Colo. Specific gravities: A, 3.72 at 16°; B, 3.629 at 23°; C, 3.721 at 17.2°. Analyses by L. G. Eakins.

E. Pyrope from the peridotite dike of Elliott County, Ky. Described by Diller in Bulletin 38. Analysis by T. M. Chatard.

F. Garnets from Hawkes's quarry, Goshen, Mass. Almandite. Analysis by George Steiger.

	A.	B.	C.	D.	E.	F.
SiO_2	37.54	37.89	39.26	36.88	41.32	37.30
TiO_2	trace				.16	.24
Al_2O_3	22.84	7.90	19.63	10.34	21.21	21.84
Cr_2O_3					.91	
Fe_2O_3	.79	16.43	4.48	17.51	4.21	.98
FeO	.26				7.93	32.62
MnO			trace		.34	1.86
CaO	36.66	35.43	36.61	34.85	4.94	3.19
MgO	.44	.59	trace	.43	19.32	2.50
Na_2O	.13	1.10	.16	trace	.07	
K_2O		trace	trace			
H_2O	1.74	.36	.08	.21	.17	
P_2O_5	trace				none	
	100.40	99.70	100.22	100.22	100.58	100.53

G. Spessartite from Amelia Court House, Amelia County, Va. Pale brown, crystalline masses. Analyzed by F. W. Clarke and described in Bulletin 60.

H. Spessartite from Llano County, Tex. Yellow, granular. Analyzed by W. H. Melville and described in Bulletin 90. FeO could not be separately determined.

I. Spessartite from cavities in rhyolite, Nathrop, Colo. Brilliant crystals. Specific gravity, 4.23 at 18°. Described by Cross in Am. Jour. Sci., 3d ser., vol. 31, p. 432. Analysis by L. G. Eakins.

J. Garnet from the Peacock mining claim, Seven Devils mining district, Idaho. Associated with bornite and powellite. Analyzed by W. H. Melville and described in Bulletin 90.

K, L. Two samples andradite from Clifton, Ariz. Analyses by George Steiger.

	G.	H.	I.	J.	K.	L.
SiO_2	35.35	35.93	35.66	38.67	36.26	42.63
TiO_2	------	trace	------	------	none	none
Al_2O_3	20.41	18.08	18.55	10.08	.78	1.53
Fe_2O_3	2.75	4.60	.32	16.00	32.43	31.41
FeO	1.75		14.25	.91	.32	.30
MnO	38.70	31.77	29.48	------	.27	.43
CaO	.94	8.48	1.15	33.35	29.67	23.37
BaO	------	trace	------	------	------	------
MgO	none	.69	------	.77	none	none
Na_2O	------	.17	.21	------	none	------
K_2O	------		.27	------	none	------
CuO	------	------	------	trace	------	------
P_2O_5	------	none	------	------	.06	trace
H_2O at 100°	.27	.03	.44	.06	.13	------
H_2O above 100°		.36			.44	------
	100.17	100.11	100.33	99.84	100.36	99.67

CHRYSOLITE.

A. Transparent green pebbles from near Fort Wingate, N. Mex. Analysis by E. A. Schneider.

B. Transparent olivine from the meteorite of Kiowa County, Kans. Described in Bulletin 78. Specific gravity, 3.376 at 23.2°. Analysis by L. G. Eakins.

C. Olivine from the peridotite dike of Elliott County, Ky. Described by Diller in Bulletin 38. Analysis by T. M. Chatard.

D. Olivine from the peridotite at Riddle, Oreg. The rock is the matrix of nickel silicates. Described by Diller and Clarke in Bulletin 60. Analysis by F. W. Clarke.

E. Olivine from olivine-gabbro, west side of Birch Lake, Minnesota. Described by Bayley, Jour. Geol., vol. 1, p. 688. Analysis by W. F. Hillebrand.

	A.	B.	C.	D.	E.
SiO_2	41.98	40.70	40.05	42.81	35.58
TiO_2	.....	.....	.07	.....	1.22
Al_2O_3	.....	trace?	.39	.....	.92
Cr_2O_3	.....	.....	.24	.79	trace
Fe_2O_3	.51	.18	2.36	2.61	33.91
FeO	5.71	10.79	7.14	7.20	
MnO	.10	.14	.20	.....	.35
NiO	.42	.02	.....	.26	.20
CoO	.....	.....	trace	.....	
MgO	51.11	48.02	46.68	45.12	26.86
CaO	.....	.....	1.16	none	.90
Na_2O	.....	.....	.08	.....	.....
K_2O	.....	.....	.21	.....	.....
H_2O at 100°	.05	.....	.14	.57	.11
H_2O above 100°	.23	.....	.66		.20
P_2O_5	.....	.....	.04	.....	.....
	100.11	99.85	99.42	99.36	100.25

MIZZONITE.

From a gulch on the side of Italian Mountain, Gunnison County, Colo. Analysis by L. A. Eakins.

SiO_2	57.55
Al_2O_3	21.53
Fe_2O_3	trace
CaO	6.18
K_2O	1.64
Na_2O	7.43
H_2O	3.23
Cl	2.82
	100.38
O equivalent to Cl	.63
	99.75

VESUVIANITE.

A. Finely crystallized material from Italian Mountain, Gunnison County, Colo. Analysis by L. G. Eakins. Specific gravity, 3.394 at 20°.

B. From Nevada, 24 kilometers northeast of Silver Peak. Analysis by George Steiger.

C. Pale green, massive. South Fork of Indian Creek, 12 miles from Happy Camp, Siskiyou County, Cal. Analysis by George Steiger.

	A.	B.	C.
SiO_2	37.11	36.80	35.86
TiO_2	----	.66	.10
Al_2O_3	19.30	17.53	18.35
Fe_2O_3	3.31	1.56	1.67
FeO	----	3.27	.39
MnO	----	.48	.05
MgO	3.89	1.23	5.43
CaO	36.24	35.00	33.51
Alkalies	----	.13	none
H_2O at 100°	.06	.10	.29
H_2O above 100°		1.56	4.18
P_2O_5	----	.07	.02
CO_2	----	.65	none
F	.58	.88	none
	100.49	99.92	99.85
O equivalent to F	.24	.36	----
	100.25	99.56	----

ZOISITE.

A. Zoisite from gabbro, east shaft of waterworks extension, Washington, D. C. Analysis by F. W. Clarke; iron determination by R. B. Riggs.

B. Rose-red zoisite, James's mica mine, Yancey County, N. C. Specific gravity, 3.352 at 27°. Analysis by L. G. Eakins.

C. Saussurite from gabbro, Sacramento River road, 37 miles north of Pit River ferry, Shasta County, Cal. Specific gravity, 3.148. Analysis by F. W. Clarke. See Bulletin 9.

D. Saussurite from the Saas Valley, Switzerland. Pale greenish. Specific gravity, 3.37. Analysis by F. W. Clarke; iron determination by R. B. Riggs.

	A.	B.	C.	D.
SiO_2	45.12	38.98	42.79	48.29
Al_2O_3	30.53	31.02	29.43	27.65
Fe_2O_3	.....	4.15	.....	.....
FeO	1.90	.....	3.65	1.45
MnO	.....	.23	.....	.....
MgO	.42	.....	1.40	5.36
CaO	17.34	23.80	18.13	12.95
Na_2O	2.02	.....	2.51	3.57
K_2O	1.09	.....	.....	trace
H_2O	.74	2.03	2.42	.54
	99.16	100.21	100.33	99.81

EPIDOTE.

A. Dark gray, brilliant crystals from Phippsburg, Me. Analyzed by W. F. Hillebrand and described in Bulletin 167.

B, C. Epidote from Italian Mountain, Gunnison County, Colo. Specific gravities: B, 3.448 at 25°; C, 3.452 at 17°. Analyses by L. G. Eakins.

	A.	B.	C.
SiO_2	38.54	38.21	37.22
Al_2O_3	28.39	28.70	24.09
Fe_2O_3	6.89	8.16	12.80
FeO	.50	.....	.79
MnO	.....	.....	.11
MgO	trace	.....	trace
CaO	24.12	24.30	23.36
Na_2O	.....	.21	.06
H_2O	2.26	.10	1.61
F	none	.35	.06
	100.70	100.03	100.10
O equivalent to F	.....	.15	.02
	.....	99.88	100.08

PIEDMONTITE.

From the rhyolite of Pine Mountain, near Monterey Station, Maryland. Contains a little admixed quartz. Analysis by W. F. Hillebrand.

SiO_2	47.37
Al_2O_3	18.55
Ce_2O_3	.75
Other rare earths, mol. wt. at 295	1.28
Fe_2O_3	4.02
Mn_2O_3	6.85
MnO	1.92
PbO	.14
CuO	.11
CaO	15.82
MgO	.25
K_2O	.68
Na_2O	.23
Li_2O	trace
H_2O at 100°	.14
H_2O above 100°	1.94
P_2O_5	trace
	100.05

ALLANITE.

From Platte Mountain, Douglas County, Colo. Specific gravity, 3.52 at 29°. Analysis by L. G. Eakins. See Proc. Colorado Sci. Soc., vol. 2, p. 32.

SiO_2	31.13
Al_2O_3	11.44
Fe_2O_3	6.24
Ce_2O_3	12.50
$(LaDi)_2O_3$	10.98
FeO	13.59
BaO	.27?
MnO	.61
CaO	9.44
MgO	.16
K_2O	trace
Na_2O	.56
H_2O	2.78
CO_2	.21
P_2O_5	trace
	99.91

PREHNITE.

A. From Paterson, N. J. Analysis by George Steiger.
B. From Fassa, Tyrol. Analysis by E. A. Schneider.

	A.	B.
SiO_2	42.31	43.32
Al_2O_3	19.95	25.50
Fe_2O_3	6.20	trace
FeO	none	----------
CaO	26.63	26.49
MgO	none	----------
H_2O at 100°	.21	.17
H_2O at 250°–300°	4.81	.14
H_2O by ignition		4.70
	100.11	100.32

TOPAZ.

A. White, opaque topaz from Stoneham, Me. Specific gravity, 3.51.

B. Alteration product of A, greenish. Specific gravity, 3.42. Analyses A and B by J. E. Whitfield. See discussion by Clarke in Bulletin 27.

C. Topaz from Florissant, Colo. Specific gravity, 3.578 at 22°. Analyzed by W. F. Hillebrand, and described in Bulletin 20.

	A.	B.	C.
SiO_2	31.92	35.15	33.15
Al_2O_3	57.38	53.18	57.01
CaO	.....	1.32	.....
MgO	.....	.17	.....
K_2O	.15	1.52	.....
Na_2O	1.33	1.28	.....
H_2O	.20	.90	.....
F	16.99	12.88	16.04
	107.97	106.40	106.20
O equivalent to F	7.16	5.42	6.75
	100.81	100.98	99.45

The final alteration of the Stoneham topaz is into muscovite, q. v. The alteration product here given represents the beginning of the process.

SILLIMANITE.

Fibrolite adze from Brittany. Specific gravity, 3.147, determined by William Hallock. Analysis by F. W. Clarke. See Bulletin 60.

SiO_2	34.66
Al_2O_3	63.24
Fe_2O_3	trace
MgO	.37
Ignition	1.31
	99.58

KYANITE.

Pale green variety, associated with the dumortierite of Clip, Ariz. Analyzed by W. F. Hillebrand. Titanic oxide is present in appreciable amounts, but was not separated from alumina. The mineral contained a few black, nonmagnetic grains, which may have carried the titanium. Specific gravity, 3.656 at 18.5°.

SiO_2	36.30
$Al_2O_3(TiO_2)$	62.51
Fe_2O_3	.70
FeO	undet.
CuO	trace
Ignition	.40
	99.91

ILVAITE.

From Golconda mine, South Mountain, Owyhee County, Idaho. Analysis by W. F. Hillebrand. Specific gravity, 4.059 at 31°.

SiO_2	29.16
Al_2O_3	.52
Fe_2O_3	20.40
FeO	29.14
MnO	5.15
CaO	13.02
MgO	.15
Na_2O	.08
H_2O at 105°	.15
H_2O above 105°	2.64
	100.41

CALAMINE.

White, highly crystalline. From Sterling, N. J. Analysis by George Steiger.

SiO_2	24.15
Al_2O_3, Fe_2O_3	.19
ZnO	67.55
CaO	.12
H_2O at 100°	.27
H_2O above 100°	7.68
	99.96

LAWSONITE.

From Tiburon Peninsula, California. Collected by F. L. Ransome. Analysis by W. F. Hillebrand.

SiO_2	38.45
TiO_2	.38
Al_2O_3	31.35
Fe_2O_3	.86
FeO	.10
MnO	trace
CaO	17.52
MgO	.17
K_2O	.23
Na_2O	.06
Ignition	11.21
	100.33

STAUROLITE.

Altered staurolite from Liberty Grove, Cecil County, Md. About two-thirds muscovite. Analysis by George Steiger.

SiO_2	50.17
TiO_2	.55
Al_2O_3	27.97
Fe_2O_3	6.13
FeO	1.18
MgO	1.15
K_2O	7.77
Na_2O	.48
H_2O at 100°	.42
H_2O above 100°	3.94
P_2O_5	.06
	99.82

GADOLINITE.

Analyses by L. G. Eakins.

A. From Llano County, Tex. Specific gravity, 4.239 at 17.4°.

B, C. From Devils Head Mountain, Douglas County, Colo. Specific gravities: B, 4.56 at 17°; C, 4.59 at 25.5°. Described in Proc. Colorado Sci. Soc., vol. 2, pt. 1, p. 32.

	A.	B.	C.
SiO_2	23.79	22.13	21.86
ThO_2	.58	.89	.81
Al_2O_3		2.34	.54
Fe_2O_3	.96	1.13	3.59
Ce_2O_3	2.62	11.10	6.87
$(La\ Di)_2O_3$	5.22	21.23	19.10
Y_2O_3	[a]41.55	[b]9.50	[b]12.63
Er_2O_3		[b]12.74	[b]15.80
FeO	12.42	10.43	11.36
MnO	trace		.11
GlO	11.33	7.19	5.46
CaO	.74	.34	.47
MgO	trace	.14	.16
K_2O	trace	.18	.20
Na_2O	trace	.28	.32
H_2O	1.03	.86	.74
P_2O_5	.05		
	100.29	100.48	100.02

[a] Molecular weight, 260.

[b] Molecular weight Y, Er group: in B, 296; in C, 294.

YTTRIALITE.

From the Barringer mine, Llano County, Tex. Analyzed by W. F. Hillebrand, and discussed in Amer. Jour. Sci., 4th ser., vol. 13, p. 145.

SiO_2	29.63
TiO_2	.05
ThO_2	10.85
UO_2	1.64
Ce_2O_3	3.07
La_2O_3 group, mol. wt., 335.6	5.18
Y_2O_3 group, mol. wt., 265.8	43.45
Fe_2O_3	.76
FeO	1.96
MnO	.88
PbO	.80
CaO	.67
MgO	.16
H_2O at 105°	.32
H_2O above 105°	.04
CO_2	.11
P_2O_5	.12
A, He, F, and alkalies by difference	.31
	100.00

ROWLANDITE.

From Llano County, Tex. Analysis by W. F. Hillebrand, with discussion in Bulletin 113. Specific gravity, 4.513 at 15.5°.

SiO_2	26.04
X[a]	.39
ThO_2	.59
Ce_2O_3	5.06
La_2O_3 group, mol. wt., 336.8	9.34
Yt_2O_3 group, mol. wt., 266.2	47.70
Fe_2O_3	.09
FeO	4.39
MnO	.67
CaO	.50
MgO	1.62
Alkalies	.28
H_2O	.24
CO_2	.34
F	3.87
P_2O_5	trace
	101.12
O equivalent to F	1.63
	99.49

MACKINTOSHITE.

From Llano County, Tex. Analyzed by W. F. Hillebrand and discussed in Bulletin 113. Specific gravity, 5.43 at 21.4°. Only nine-tenths of a gram available for analysis.

[a] A mixture of indefinable earths with some uranium and a trace of titanium.

SiO_2	13.90
UO_2	22.40
ZrO_2 ?	.88
ThO_2, Ce_2O_3	45.30
La_2O_3 group, Yt_2O_3 group	1.86
PbO	3.74
FeO	1.15
CaO	.59
MgO	.10
K_2O	.42
$(NaLi)_2O$	.68
P_2O_5	.67
H_2O at 100°	.50
H_2O above 100°	4.31
	96.50

CYRTOLITE.

A doubtful mineral from Devils Head Mountain, Douglas County, Colo. Analyses by W. F. Hillebrand, with description in Proc. Colorado Sci. Soc., vol. 3, pt. 1, p. 44. Brown crystalline growths of irregular form. Specific gravities: A, 3.70; B, 3.60; C, 3.64. The material may be a mixture of cyrtolite or some analogous alteration of zircon with limonite and a phosphate.

	A.	B.	C.
SiO_2	20.06	20.64	19.21
Ta_2O_5	47.99	.71	51.00
SnO_2		.03	
ZrO_2		47.81	
ThO_2	1.16	1.20	.60
Ce_2O_3	.06		
$(LaDi)_2O_3$	.19		
Er_2O_3	4.77	4.76	4.55
Y_2O_3	2.27	2.48	3.13
Fe_2O_3	5.53	5.97	4.86
MnO	.47	.57	.33
CaO	1.99	1.93	2.15
MgO	.13	.11	----------
K_2O	.20	.10	.17
Na_2O	.46	.50	.42
H_2O	12.87	12.00	12.97
P_2O_5	1.64	1.75	.93
F	.25	.42	.42
	100.04	100.98	100.74

DANBURITE.

From Russell, N. Y. Analysis by J. E. Whitfield. See Bulletin 55.

SiO_2	49.70
B_2O_3	25.80
CaO	23.26
Fe_2O_3, Al_2O_3	1.02
Ignition	.20
	99.98

DATOLITE.

From Bergen Hill, N. J. Analysis by J. E. Whitfield. See Bulletin 55.

SiO_2	35.74
B_2O_3	22.60
CaO	35.14
FeO	.31
H_2O	6.14
	99.93

AXINITE.

Analyses by J. E. Whitfield, with discussion in Bulletin 55.

A. Clove brown, from Cornwall, England. Translucent.

B. Pearl gray, from Bourg d'Oisans, Dauphiny. Transparent.

	A.	B.
SiO_2	42.10	41.53
Al_2O_3	17.40	17.90
Fe_2O_3	3.06	3.90
FeO	5.84	4.02
CaO	20.53	21.66
MnO	4.63	3.79
MgO	.66	.74
B_2O_3	4.64	4.62
H_2O	1.80	2.16
	100.66	100.32

DUMORTIERITE.

A. Harlem, N. Y. Analysis by R. B. Riggs. See Am. Jour. Sci., 3d ser., vol. 34, p. 406.

B. Harlem, N. Y. Analysis by J. E. Whitfield.

C. Near Clip, Yuma County, Ariz. Analysis by J. E. Whitfield.

D. Purified sample from Clip. Analysis by Whitfield. Specific gravity a little over 3.265.

See note by Whitfield in Bulletin 60, and paper by Diller and Whitfield in Bulletin 64.

	A.[a]	B.	C.	D.
SiO_2	34.82	31.44	31.52	27.99
Al_2O_3	55.30	68.91	63.66	64.49
Fe_2O_3	trace			
CaO	trace		trace	
MgO	.57		.52	trace
Na_2O	1.76		.37	
K_2O	1.04		.11	
Li_2O	trace			
B_2O_3	4.07	trace	2.62	4.95
P_2O_5				.20
Ignition	2.96		1.34	1.72
	100.52	100.35	100.14	99.35

[a] Sample A contaminated by tourmaline.

TOURMALINE.

Analyses A to V, inclusive, by R. B. Riggs. Discussed by Riggs in Bulletin 55.

A. Pink center of crystals having a green margin, from Calhao, province of Minas-Geraes, Brazil. Specific gravity, 3.028.

B. Pale green, border of A.

C. Olive-green, also from Calhao, Brazil.

D. Rose-colored, massive, from Black Mountain, Rumford, Me. Specific gravity, 2.997.

E. Dark green, massive, same locality as D.

	A.	B.	C.	D.	E.
SiO_2	37.19	37.39	36.91	38.07	36.53
Al_2O_3	42.43	39.65	38.13	42.24	38.10
Fe_2O_3	none	.15	.31	.....	none
FeO	.52	2.29	3.19	.26	6.43
MnO	.79	1.47	2.22	.35	.32
MgO	none	none	.04	.07	none
CaO	.57	.49	.38	.56	.34
Li_2O	1.73	1.71	1.61	1.59	.95
Na_2O	2.24	2.42	2.70	2.18	2.86
K_2O	.23	.25	.28	.44	.38
P_2O_5	none	trace	.11	none	trace
B_2O_3	10.06	10.29	9.87	9.99	10.22
H_2O	3.90	3.63	3.64	4.26	3.52
F	trace?	.32	.14	.28	.16
	99.66	100.06	99.53	100.29	99.81
O equivalent to F	.....	.13	.06	.12	.07
	.....	99.93	99.47	100.17	99.74

F. Alteration product of the Rumford tourmaline.

G. Alteration product of rubellite, from Hebron, Me.

H. Colorless to very pale pinkish or greenish crystals, Auburn, Me. Specific gravity, 3.07.

I. Light-green crystals, Auburn, Me.

J. Dark green, massive tourmaline, Auburn, Me.

	F.	G.	H.	I.	J.
SiO_2	53.03	43.90	38.14	37.85	36.26
Al_2O_3	31.67	38.71	39.60	37.73	36.68
Fe_2O_3	.51	.58	.30	.42	.15
FeO	.....	.25	1.38	3.88	7.07
MnO	trace	.04	1.38	.51	.72
MgO	trace	.05	trace	.04	.16
CaO	trace	.41	.43	.49	.17
Li_2O	.26	.....	1.34	1.34	1.05
Na_2O	.54	1.05	2.36	2.16	2.88
K_2O	9.44	10.92	.27	.62	.44
B_2O_3	trace	trace	10.25	10.55	9.94
P_2O_5	.....	.....	trace	trace	trace
H_2O	4.80	4.25	4.16	4.18	4.05
F	trace?	none	.62	.62	.71
	100.25	100.16	100.23	100.39	100.28
O equivalent to F	.....	.....	.26	.26	.30
	.....	.....	99.97	100.13	99.98

K. White to light-brown crystals, Dekalb, St. Lawrence County, N. Y. Specific gravity, 3.085.

L. Brown tourmaline, Gouverneur, St. Lawrence County, N. Y.

M. Cinnamon-brown crystals, Hamburg, N. J.

N. Brilliant black crystals, Pierrepont, St. Lawrence County, N. Y. Specific gravity, 3.08.

O. Dark-brown crystals, Orford, N. H.

P. Dark-brown crystals, Monroe, Conn.

	K.	L.	M.	N.	O.	P.
SiO_2	36.88	37.39	35.25	35.61	36.66	36.41
TiO_2	.12	1.19	.65	.55	.23	1.61
Al_2O_3	28.87	27.79	28.49	25.29	32.84	31.27
Fe_2O_3	.....	.10	none	.44	none	none
FeO	.52	.64	.86	8.19	2.50	3.80
MnO	none	none	none	trace	trace	trace
MgO	14.53	14.09	14.58	11.07	10.35	9.47
CaO	3.70	2.78	5.09	3.31	1.35	.98
SrO	trace	trace	trace	none	trace	trace
Li_2O	trace	trace	trace	trace	trace	none
Na_2O	1.39	1.72	.94	1.51	2.42	2.68
K_2O	.18	.16	.18	.20	.22	.21
B_2O_3	10.58	10.73	10.45	10.15	10.07	9.65
P_2O_5	undet.	none	trace	trace	none	trace
H_2O	3.56	3.83	3.10	3.34	3.78	3.79
F	.50	trace?	.78	.27	trace?	none
	100.83	100.42	100.37	99.93	100.42	99.87
O equivalent to F	.21	.....	.33	.11	.....	.....
	100.62	.....	100.04	99.82	.....	.....

Q. Massive, black tourmaline, Auburn, Me. Specific gravity, 3.19.
R. Massive, black tourmaline, Paris, Me.
S. Black tourmaline, Calhao, Brazil. Specific gravity, 3.20.
T. Black tourmaline, Haddam, Conn.

	Q.	R.	S.	T.
SiO_2	34.99	35.03	34.68	34.95
TiO_2	none	----	----	.57
Al_2O_3	33.96	34.44	32.70	31.11
Fe_2O_3	none	1.13	.31	.50
FeO	14.23	12.10	13.69	11.87
MnO	.06	.08	.12	.09
MgO	1.01	1.81	2.13	4.45
CaO	.15	.24	.33	.81
Li_2O	trace	.07	.08	trace
Na_2O	2.01	2.03	2.11	2.22
K_2O	.34	.25	.24	.24
B_2O_3	9.63	9.02	9.63	9.92
P_2O_5	trace	trace	none	trace
H_2O	3.62	3.69	3.49	3.62
F	none	none	.06	none
	100.00	99.89	99.52	100.35
O equivalent to F	----	----	.02	----
	----	----	99.50	----

U. Black crystal, Nantic Gulf, Baffin Land. Specific gravity, 3.095.

V. Black crystal, Stony Point, Alexander County, N. C. Specific gravity, 3.13.

W. Brown tourmaline from near Colfax, Nevada County, Cal. Fine, radiating needles. Specific gravity, 3.065. Incomplete analysis by W. H. Melville. See Bulletin 90.

X. Chrome tourmaline from near Etchison, Montgomery County, Md. Analysis by T. M. Chatard. See Bulletin 64.

	U.	V.	W.	X.
SiO_2	35.34	35.56	36.40	36.57
TiO_2	.40	.55	.....	.09
Al_2O_3	30.49	33.38	33.64	32.58
Cr_2O_3	.....	.....	.....	4.32
Fe_2O_3	none	none	3.13	.79
FeO	8.22	8.49		
MnO	trace	.04	.....	trace
NiO	.....	.....	.....	.05
MgO	7.76	5.44	10.01	9.47
CaO	2.32	.53	1.51	.75
SrO	trace	none	.....	.....
Li_2O	trace	trace	.....	trace
Na_2O	1.76	2.16	2.49	2.22
K_2O	.15	.24	.12	.13
B_2O_3	10.45	10.40	[a]8.74	8.90
P_2O_5	none	(?)	.....	.04
H_2O	3.60	3.63	3.53	3.74
F	none	none	.74	.06
	100.49	100.42	100.31	99.71
O equivalent to F	.....	.....	.31	.02
	.....	.....	100.00	99.69

[a] By difference.

GYROLITE.

Associated with the apophyllite of New Almaden, Cal. Fibrous. Analyzed by F. W. Clarke and described in Bulletin 64.

SiO_2	52.54
Al_2O_3, Fe_2O_3	.71
CaO	29.97
K_2O	1.56
Na_2O	.27
F	.65
Ignition	14.60
	100.30
O equivalent to F	.27
	100.03

APOPHYLLITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Apophyllite.

B. Decomposition product of apophyllite.

	A.	B.
SiO_2	51.89	67.96
Al_2O_3	1.54	8.48
Fe_2O_3	.13	1.04
CaO	24.51	5.47
MgO		.53
K_2O	3.81	1.23
Na_2O	.59	[a].74
H_2O	16.52	14.55
F	1.70	none
	100.69	100.00
O equivalent to F	.72	
	99.97	

[a] By difference.

PTILOLITE.

Described as a new species by Cross and Eakins in Am. Jour. Sci., 3d ser., vol. 32, p. 117, and vol. 44, p. 96. Analyses by L. G. Eakins.

A. From Green Mountain, Jefferson County, Colo.

B. From 3 miles south of Silver Cliff, Custer County, Colo.

	A.	B.
SiO_2	70.35	67.83
Al_2O_3	11.90	11.44
CaO	3.87	3.30
K_2O	2.83	.64
Na_2O	.77	2.63
H_2O at 110°	10.18	3.62
H_2O at 125°		1.31
H_2O at 300°		5.41
H_2O at redness		3.10
	99.90	99.28

HEULANDITE.

A. From Green Mountain, Jefferson County, Colo. Analysis by L. G. Eakins.

B. From Anthracite Creek, Gunnison County, Colo. Analysis by L. G. Eakins. Specific gravity, 2.24 at 20.1°.

C. From Berufiörd, Iceland. Analysis by George Steiger.

	A.	B.	C.
SiO_2	59.17	57.38	57.10
Al_2O_3	16.80	17.18	16.82
Fe_2O_3		trace	
MgO			.07
CaO	7.10	8.07	6.95
SrO			.46
Na_2O	1.37	.82	1.25
K_2O	.34	.40	.42
H_2O at 110°	15.45	2.57	3.61
H_2O at 125°		1.10	
H_2O at 300°		11.70	13.00
H_2O at redness		.90	
	100.23	100.12	99.68

STILBITE.

A. From Wassons Bluff, near Parrsboro, Nova Scotia. Analysis by George Steiger.

B. From Italian Mountain, Gunnison County, Colo. Analysis by L. G. Eakins.

C. From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	55.41	57.75	54.67
Al_2O_3	16.85	16.64	16.78
Fe_2O_3	.18		
MgO	.05		
CaO	7.78	8.58	7.98
Na_2O	1.23	trace	1.47
H_2O at 100°	3.60	17.17	19.16
H_2O above 100°	15.41		
	100.51	100.14	100.06

LAUMONTITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Yellow grains.

B. White crystals.

	A.	B.
SiO_2	51.45	52.07
Al_2O_3	21.52	21.30
Fe_2O_3	.94	
CaO	11.88	11.24
K_2O	.35	.42
Na_2O	.19	.48
H_2O	13.81	14.58
	100.12	100.09

CHABAZITE.

A. From Wassons Bluff, near Parrsboro, Nova Scotia. Analysis by George Steiger.

B, C. From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

	A.	B.	C.
SiO_2	50.78	47.86	47.18
Al_2O_3	17.18	19.30	19.67
Fe_2O_3	.40	.12	.....
MgO	.04	.....	.....
CaO	7.84	9.94	9.74
SrO	.....		.43
Na_2O	1.28	.52	.51
K_2O	.73	.35	.37
H_2O at 100°	5.22	22.07	4.76
H_2O above 100°	16.63		17.39
	100.10	100.16	100.05

LEVYNITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Crystals of levynite.

B. Associated fibrous variety.

	A.	B.
SiO_2	46.76	46.97
Al_2O_3	21.91	22.39
CaO	11.12	10.85
K_2O	.21	1.17
Na_2O	1.34	.79
H_2O	18.65	18.03
	99.99	100.20

ANALCITE.

A. From Wassons Bluff, near Parrsboro, Nova Scotia. Analysis by George Steiger. See Bulletin 207.

B. From Table Mountain, Golden, Colo. Analysis by George Steiger. See Bulletin 207.

C, D. From Table Mountain. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

	A.	B.	C.	D.
SiO_2	57.06	55.72	55.82	55.80
Al_2O_3	21.48	23.06	22.42	22.45
Fe_2O_3	.13			
CaO	.16	.17		
Na_2O	12.20	12.46	13.48	13.45
H_2O at 100°	.58	.13	8.38	8.35
H_2O above 100°	8.38	8.26		
	99.99	99.80	100.10	100.05

NATROLITE.

A. From Bergen Hill, New Jersey. Analysis by George Steiger. See Bulletin 207.

B. From Magnet Cove, Arkansas. Analysis by W. H. Melville. Described in Bulletin 90. Specific gravity, 2.261.

C. From South Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	46.62	47.56	43.66
Al_2O_3	26.04	26.82	24.89
Fe_2O_3	none	.23	
CaO	1.48	.13	4.87
MgO	none	.09	
Na_2O	15.67	15.40	14.66
H_2O at 100°	.39	.07	[a]8.09
H_2O above 100°	10.18	9.56	
CO_2			[b]3.83
	100.38	99.86	100.00

[a] By difference. Too little material for complete analysis.
[b] Calculated to satisfy total line.

SCOLECITE.

A. From Whale Cove, Grand Manan, New Brunswick. Analysis by George Steiger. See Bulletin 207.

B. From Italian Mountain, Gunnison County, Colo. Analysis by L. G. Eakins. Specific gravity, 2.247 at 17.2°.

C. From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	45.86	45.90	46.03
Al_2O_3	25.78	26.51	25.28
Fe_2O_3	----------	----------	.27
CaO	13.92	14.17	12.77
MgO	----------	trace	----------
Na_2O	.41	trace	1.04
K_2O	----------	----------	.13
H_2O at 100°	.40	----------	[a] 14.48
H_2O above 100°	13.65	13.79	
	100.02	100.37	100.00

[a] By difference.

MESOLITE.

From North Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

SiO_2	46.17
Al_2O_3	26.88
CaO	8.77
Na_2O	6.19
H_2O	12.16
	100.17

THOMSONITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses A, B, C, D, E by W. F. Hillebrand. Analysis F by George Steiger; published in Bulletin 207. A represents reddish spherules; F, a mass of fibrous structure.

	A.	B.	C.	D.	E.	F.
SiO_2	40.52	40.88	40.68	41.21	42.66	41.13
Al_2O_3	29.22	29.68	30.12	29.71	29.25	29.58
Fe_2O_3	.79					
CaO	12.43	11.88	11.92	11.34	10.90	11.25
Na_2O	4.31	4.72	4.44	5.62	4.92	5.31
H_2O at 100°	12.79	12.91	12.86	12.20	12.28	1.01
H_2O above 100°						12.12
	100.06	100.07	100.02	100.08	100.01	100.40

HYDRONEPHELITE.

From the elæolite-syenite of Litchfield, Me. Described by Clarke as a new species in Bulletin 42. Analyses by F. W. Clarke. Specific gravity, 2.263, determined by J. S. Diller.

A, B. Slightly impure. Two distinct samples.

C. Carefully purified material dried at 100°.

	A.	B.	C.
SiO_2	38.90	39.24	38.99
Al_2O_3	33.98	33.16	33.62
Fe_2O_3	trace	trace	
CaO	.05	trace	.07
Na_2O	13.21	13.07	13.07
K_2O	1.01	.88	1.12
H_2O	13.12	13.30	12.98
	100.27	99.65	99.85

MUSCOVITE.

A. From the Hatch farm, Auburn, Me. Broad plates, bordered by lepidolite. Analysis by R. B. Riggs.

B. Greenish muscovite, Auburn, Me. Analysis by E. A. Schneider.

C. Altered muscovite, Mount Mica, Paris, Me. Occurs as a white enamel on ordinary mica. Analysis by F. W. Clarke.

D. Well-crystallized muscovite from the hiddenite mine, Stony Point, Alexander County, N. C. Analysis by F. W. Clarke.

E. White muscovite from Miask, Ural Mountains, Siberia. Analysis by E. A. Schneider.

F. Mica separated from quartz-schist. Shoemaker's quarry, near Stevenson Station, Green Spring Valley, Maryland. Analysis by E. A. Schneider.

G. Mica from the Eureka tunnel, St. Peters Dome, near Pikes Peak, Colorado. Analysis by W. F. Hillebrand. See Bulletin 20.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	44.39	46.54	46.61	45.40	44.17	44.93	52.59
TiO_2	.....	none	.....	1.10	.....	1.05	.....
Al_2O_3	35.70	34.96	35.61	33.66	37.35	29.81	29.72
Fe_2O_3	1.09	1.59		2.36	1.29	6.10	1.40
FeO	1.07	.....	.....	.....	.20		
MnO	trace	.....	trace	.....	.10	trace	.....
MgO	.....	.32	.....	1.86	.....	1.16	2.12
CaO	.10	.....	trace	.....	.....	.....	.26
Li_2O	.....	.....	.....	trace	.....	trace	.....
Na_2O	2.41	.41	1.76	1.41	1.14	.50	.50
K_2O	9.77	10.38	8.86	8.33	10.00	10.28	8.33
H_2O at 100°	5.88	.71	6.50	5.46	1.06	1.38	4.39
H_2O above 100°		4.72			4.67	4.88	
F	.72	none	.....	.69	.90	.22	.....
	101.13	99.63	99.34	100.27	100.88	100.31	99.31
O equivalent to F	.30	.....	.....	.29	.37	.09	.....
	100.83	.....	.....	99.98	100.51	100.22	.....

H. Fuchsite. Etchison post-office, Montgomery County, Md. Analysis by T. M. Chatard. See Bulletin 64.

I. Grayish-green, compact mica from Stoneham, Me. Structure subfibrous. Analysis by T. M. Chatard.

J. Same locality as I. Specimen broadly foliated, micaceous. Analysis by T. M. Chatard. For analyses I and J see Bulletin 9.

K. Stoneham, Me. From alteration of topaz, the outer portion of an altered crystal. Specific gravity, 2.82. Analysis by J. E. Whitfield. Discussed by Clarke in Bulletin 27.

L. Pseudomorph from the Rochelle mine, on Running Water River, Wyoming. Near liebenerite. Specific gravity, 2.831 at 12.5°. Analyzed by W. F. Hillebrand and described in Bulletin 20.

M. Mariposite. From vein of the Josephine gold quartz mine, Bear Valley, Mariposa County, Cal. Color, green. Specific gravity, 2.817 at 29.5°.

N. White mariposite, same locality as M. Specific gravity, 2.787 at 28.5°. Analyses M and N by W. F. Hillebrand, and described in Bulletin 167.

	H.	I.	J.	K.	L.	M.	N.
SiO_2	42.21	45.19	45.34	44.52	45.54	55.35	56.79
TiO_2						.18	
Al_2O_3	34.55	33.32	33.96	46.19	37.15	25.62	25.29
Cr_2O_3	2.03				.79	.18	none
Fe_2O_3	1.03					.63	1.59
FeO		4.25	3.96			.92	
MnO	trace	.58	.51	.21			
CaO	.47	trace	.22	.30		.07	.07
MgO	3.13	.36	.10	.14	.38	3.25	3.29
Li_2O						trace	trace
Na_2O	.82	1.57	1.49	2.82	.90	.12	.17
K_2O	9.16	11.06	10.73	2.30	10.70	9.29	8.92
H_2O at 110°	.20	4.48	4.78	3.74	4.80	4.52	4.72
H_2O above 110°	6.57						
F				.40			
	100.17	100.81	101.09	100.62	100.26	100.13	100.84
O equivalent to F				.16			
				100.46			

LEPIDOLITE.

From various localities in Maine. Analyses by R. B. Riggs. Discussion by F. W. Clarke in Bulletin 42.

A. From Black Mountain, Rumford. Lilac-purple, granular.
B. From Mount Mica, Paris. Broadly foliated.
C. From Hebron. Purple, coarsely granular.
D. From Auburn. Purple border on plates of muscovite.
E. From Auburn. Purple, coarsely granular.
F. From Norway. White, coarsely granular.
G. From Norway. Brownish, finely granular.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	51.52	50.92	48.80	49.62	51.11	49.52	50.17
Al_2O_3	25.96	24.99	28.30	27.30	25.26	28.80	25.40
Fe_2O_3	.31	.30	.29	.31	.20	.40	.87
FeO	undet.	.23	.09	.07	.07	.24	.45
MnO	.20	trace	.08	.55	.17	.07	.23
CaO	.16	trace	.10	.....	.12	.13	undet.
MgO	.02	trace	.07	.....	.01	.02	undet.
Li_2O	4.90	4.20	4.49	4.34	4.98	3.87	4.03
Na_2O	1.06	2.11	.74	2.17	1.43	.13	
K_2O	11.01	11.38	12.21	8.03	10.51	8.82	13.40
Rb_2O	.....	trace		2.44	1.29	3.73	
Cs_2O	.....	trace		.72	.45	.08	
H_2O	.95	1.96	1.73	1.52	.94	1.72	2.02
F	5.80	6.29	4.96	5.45	6.57	5.18	5.05
	101.89	102.38	101.86	102.52	103.11	102.71	101.62
O equivalent to F	2.44	2.64	2.02	2.29	2.76	2.18	2.13
	99.45	99.74	99.84	100.23	100.35	100.53	99.49

CRYOPHYLLITE.

From Rockport, Mass. Analyses by R. B. Riggs. Discussed by Clarke in Bulletin 42.

A. Brilliant, broadly foliated, blackish-green variety.

B. Paler, dull green, less lustrous, probably somewhat altered.

C. Granular, resembling chlorite.

	A.	B.	C.
SiO_2	51.96	51.46	52.17
Al_2O_3	16.89	16.22	16.39
Fe_2O_3	2.63	2.21	4.11
FeO	6.35	7.66	6.08
MnO	.24	.06	.32
CaO	.12	trace	trace
MgO	.03	.17	trace
Li_2O	4.93	4.83	5.03
Na_2O	.92	.95	.60
K_2O	10.66	10.65	10.54
H_2O	1.22	1.06	1.43
F	6.78	7.44	7.02
	102.73	102.71	103.69
O equivalent to F	2.86	3.11	2.95
	99.87	99.60	100.74

BIOTITE.

A. From Merrow Ledge, Auburn, Me. Black. Analysis by F. W. Clarke and R. B. Riggs.

B. Bronze-mica, Laurel Creek corundum mine, Rabun County, Ga. Analysis by E. A. Schneider. The loss is due to undetermined volatile matter.

C. Brown mica from the granite of the Yosemite Valley, California. Analysis by William Valentine. Described by Turner, Am. Jour. Sci., 4th ser., vol. 7, p. 294.

D. Mica from quartz-monzonite, Tioga road, southeast of Mount Hoffman, Mariposa County, Cal. Specific gravity, 3.05 at 21°. Analysis by W. F. Hillebrand. Described by Turner, loc. cit.

E. Black mica from quartz-monzonite. About 1 kilometer south of Bloods Station, Alpine County, Cal. Analysis by William Valentine. Described by Turner, loc. cit.

F. Reddish-brown mica from pyroxenic gneiss. North fork of Mokelumne River, above mouth of Bear River, Amador County, Cal. Analysis by William Valentine. Described by Turner, loc. cit.

G. Biotite from the granite of Butte, Mont. See Weed, Jour. Geol., vol. 7, p. 737. Analysis by H. N. Stokes.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	34.67	36.12	35.64	35.75	35.62	36.62	35.79
TiO_2	.....	1.18	1.12	3.16	2.61	3.03	3.51
Al_2O_3	30.09	20.49	18.62	14.70	15.24	14.37	13.70
V_2O_3	.....	.....	.....	.05	.....	.....	.....
Cr_2O_3	.....	.....	.....	trace	.....	.....	.....
Fe_2O_3	2.42	3.29	5.54	4.65	4.69	4.04	5.22
FeO	16.14	5.17	14.60	14.08	13.67	17.09	13.72
MnO	.85	.17	.79	.45	.74	.40	.19
NiO	.....	.34	.....	.02	.....	.....	.....
CoO	.....	.....	.....		.....	.....	.....
CaO	none	.28	.90	.17	.95	1.48	.05
SrO	.....	.....	.....	(?)	trace	trace	.....
BaO	.....	.09	trace	.12	.26	.33	.13
MgO	1.98	19.61	9.72	12.37	12.70	9.68	12.13
Li_2O	.....	trace	trace	.....	trace	trace	trace
Na_2O	1.67	.78	.38	.32	.50	.45	.15
K_2O	7.55	8.14	9.22	9.19	7.72	8.20	9.09
H_2O at 105°	4.64	1.58	.48	1.03	.94	.90	1.21
H_2O above 105°		.82	2.54	3.64	4.36	3.26	3.64
P_2O_5	.....	.....	.20	.03	none	none	.10
F	.28	.60	.26	.17	none	.10	.76
Cl	.....	.....	.....	.....	.....	.....	.20
	100.29	98.66	100.01	99.90	100.00	99.95	99.59
Less O	.12	.26	.11	.07	.....	.04	.37
	100.17	98.40	99.90	99.83	.....	99.91	99.22

PHLOGOPITE.

A. From Edwards, St. Lawrence County, N. Y. Outwardly resembles talc. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

B. From Burgess, Canada. Brown. Analysis by E. A. Schneider. See Clarke and Schneider, Bulletin 78.

C. Phlogopite separated from the wyomingite of the Leucite Hills, Wyoming. Described by Cross in Am. Jour. Sci., 4th ser., vol. 4, p. 115. Analysis by W. F. Hillebrand.

The following micas of doubtful character occur in serpentine. Analyses by Charles Catlett. See Bulletin 64.

D. Brown mica, from the serpentine of Montville, N. J.

E. Yellowish mica, same locality as D.

F. White mica, same locality.

G. White mica from near Easton, Pa.

E, F, and G are perhaps to be called vermiculites rather than micas.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	45.05	39.66	42.56	39.38	32.52	39.14	41.82
TiO_2		.56	2.09				
Al_2O_3	11.25	17.00	12.18	15.92	18.14	15.70	11.12
Cr_2O_3			.73				
Fe_2O_3		.27	2.73	.71	2.30	1.68	2.68
FeO	.14	.20	.90	.80			
CaO		none	.20	.28	1.44	5.24	
SrO			trace				
BaO		.62	1.00				
MgO	29.38	26.49	22.40	26.85	29.26	25.44	29.82
Li_2O	.07		trace				
Na_2O	.45	.60	.44	.62	1.38	.64	.36
K_2O	8.52	9.97	10.70	9.84	2.78	2.06	6.08
H_2O at 105°	5.37	.66		.38	.76	1.10	.94
H_2O above 105°		2.33	2.35	4.69	10.12	9.10	7.10
CO_2				.30	1.80		
P_2O_5		trace	.06				
F		2.24	2.46	.62			
	100.23	100.60	100.80	100.39	100.50	100.10	99.92
O equivalent to F		.94	1.03	.26			
		99.66	99.77	100.13			

LEPIDOMELANE.

A. From Litchfield, Me. Analyzed by F. W. Clarke, and described in Bulletin 42.

B. Same as A. Later analysis by Clarke. See Bulletin 55.

C. Annite. From Rockport, Mass. Analysis by R. B. Riggs. Discussion by Clarke in Bulletin 42.

D. From Port Henry, N. Y. Analysis by E. A. Schneider. See paper by Clarke and Schneider in Bulletin 78.

E. From Baltimore, Md. Analysis by F. W. Clarke, and discussed in Bulletin 55.

F. From near Pikes Peak, Colorado. Siderophyllite? The slightly altered margin of a large crystal.

G. Much altered central portion of specimen F. Analyses F and G by F. W. Clarke and R. B. Riggs. Described by Clarke in Bulletin 55. Classed by Dana under biotite.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	32.09	32.35	32.03	34.52	35.78	34.21	34.63
TiO_2	.....	trace	3.42	2.70	.....	.....	.....
Al_2O_3	18.52	17.47	11.92	13.22	16.39	16.53	17.95
Fe_2O_3	19.49	24.22	8.09	7.80	14.55	20.15	31.25
FeO	14.10	13.11	30.41	22.27	11.02	14.17	3.01
MnO	1.42	1.02	.21	.41	1.08	.91	.34
CaO	.....	none	.23	none	none	.48	.81
MgO	1.01	.89	.06	5.82	8.67	1.34	1.08
NiO,CoO	.....	.....	.....	.30	.....	.....	.....
Li_2O	.....	.....	trace	.04	.....	.....	.....
Na_2O	1.55	.70	1.54	.16	.56	1.43	.89
K_2O	8.12	6.40	8.46	8.59	7.76	6.50	1.96
H_2O at 105°	4.62	4.67	4.19	.57	4.48	4.54	7.82
H_2O above 105°				3.82			
P_2O_5	.....	.....	.....	trace	.....	.....	.....
F	none	none	trace	.34	none	.08	.54
	100.92	100.83	100.47	100.56	100.29	100.34	100.28
O equivalent to F	.....	.....	.....	.14	.....	.03	.22
	.....	.....	.....	100.42	.....	100.31	100.06

ROSCOELITE.

Analyses by W. F. Hillebrand.

A. From the Stockslager mine, near Lotus, Eldorado County, Cal. Described by Hillebrand in Bulletin 167.

B. Soluble portion of a vanadiferous sandstone from Placerville, Colo. Described by Hillebrand in Am. Jour. Sci., 4th ser., vol. 10, p. 130.

	A.	B.
SiO_2	45.17	46.06
TiO_2	.78	
Al_2O_3	11.54	22.55
V_2O_3	24.01	12.84
Fe_2O_3		.73
FeO	1.60	
CaO		.44
BaO		1.35
MgO	1.64	.92
Li_2O	trace	
Na_2O	trace	.22
K_2O	10.37	8.84
H_2O at 100°	.40	1.98
H_2O above 100°	4.29	4.07
	99.80	100.00

MARGARITE.

A. Brownish yellow, from Iredell County, N. C. Analysis by T. M. Chatard. See Bulletin 9.

B. Bright green, associated with pink corundum. From Gainesville, Ga. Specific gravity, 3.00. Analysis by T. M. Chatard. See Bulletin 9.

C. Inclusion in diorite, Crugers Station, near Peekskill, N. Y. Analysis by T. M. Chatard.

	A.	B.	C.
SiO_2	31.15	31.72	32.73
Al_2O_3	49.51	50.03	46.58
FeO	trace	trace	5.12
MgO	.45	.12	1.00
CaO	11.13	11.57	11.04
Na_2O	2.74	2.26	
H_2O at 110°	5.68	4.88	.12
H_2O above 110°			4.49
	100.66	100.58	101.08

CHLORITOID.

From a phyllite rock near Liberty, Md. Analysis by L. G. Eakins. See Bulletin 168, p. 50.

SiO_2	23.40
Al_2O_3	39.31
Fe_2O_3	5.14
FeO	21.94
MgO	2.18
CaO	trace
Na_2O	.20
K_2O	.20
H_2O	6.81
TiO_2	1.19
MnO	trace
P_2O_5	trace
	100.37

XANTHOPHYLLITE.

Variety waluewite, from the Nikolai-Maximilian mine, district of Slatoust, Urals, Siberia. Analysis by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 113.

SiO_2	16.85
TiO_2	trace
Al_2O_3	42.33
Fe_2O_3	2.35
FeO	.20
CaO	13.30
MgO	20.77
H_2O at 105°	.04
H_2O above 105°	4.56
	100.40

THE VERMICULITES.

A. Jefferisite, from Westchester, Pa. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

B. Vermiculite, near jefferisite or culsageeite, from Corundum Hill, North Carolina. Analyzed by T. M. Chatard and described by him in Bulletin 42.

C. Altered biotite from the zircon mine, Green River, Henderson County, N. C. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 90.

D. Kerrite, from near Franklin, Macon County, N. C. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

E. Lucasite. Described as a new species by Chatard in Bulletin 42. Analysis by T. M. Chatard. From Corundum Hill, North Carolina. Specific gravity, 2.613 at 25.5°.

	A.	B.	C.	D.	E.
SiO_2	34.20	37.96	38.18	38.13	39.81
TiO_2	------	------	1.68	------	------
Al_2O_3	16.58	22.53	14.02	11.22	12.99
Cr_2O_3	------	------	------	------	.54
Fe_2O_3	7.41	11.12	13.02	2.28	5.29
FeO	1.13	.30	2.22	.18	.11
MnO	------	.12	.38	------	.05
NiO	------	------	------	.48	------
CoO	------	------	------	trace	------
CaO	------	none	.17	------	.14
BaO	------	------	.06	------	------
MgO	20.41	15.46	14.62	27.39	24.83
Na_2O	------	undet.	.48	------	.20
K_2O	------	undet.	5.40	------	5.76
H_2O at 105°	21.14	12.63	3.20	20.47	3.78
H_2O above 105°			7.32		6.98
	100.87	100.12	100.75	100.15	100.48

F. Hallite from Nottingham, Chester County, Pa.

G. White lennilite from Lenni, Delaware County, Pa.

H. Brown lennilite, same locality.

I. Green lennilite, same locality.

Analyses F to I by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 90.

	F.	G.	H.	I.
SiO_2	35.54	36.72	35.09	34.90
TiO_2	undet.	.18	.58	.10
Al_2O_3	9.74	10.06	12.05	10.60
Fe_2O_3	9.07	5.37	6.67	8.57
Cr_2O_3		.26	.46	.23
FeO	.28	.12	.11	.22
MnO	.25	.31	.27	.17
NiO	.16	.20	.20	.19
MgO	30.05	29.40	27.62	28.21
BaO			trace	
H_2O at 105°	2.64	6.40	5.70	4.99
H_2O above 105°	12.14	11.37	11.20	11.48
	99.87	100.39	99.95	99.66

J. A vermiculite from Newlin, Chester County, Pa.

K. Painterite from Middleton, Delaware County, Pa.

L. Another sample of painterite.

Analyses J, K, L by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 90.

M. Hydromica from Rocky Hill, N. J. Analysis by George Steiger. Described by Clarke and Darton in Bulletin 167.

N. Analysis M corrected by deduction of calcite, union of like radicals, and recalculation to 100 per cent.

O. Protovermiculite from Magnet Cove, Arkansas. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 90.

	J.	K.	L.	M.	N.	O.
SiO_2	31.23	34.86	33.95	32.72	40.24	34.03
TiO_2	------	trace	trace	.24	------	undet.
Al_2O_3	17.52	11.64	12.52	8.41	10.34	14.49
Cr_2O_3	.14	------	------	------	------	------
Fe_2O_3	4.70	3.78	4.40	19.99	24.57	7.71
FeO	1.20	.20	.20	4.24	5.21	.14
MnO	.20	------	------	------	------	.09
NiO	.33	.14	.23	------	------	------
CaO	------	.07	none	10.30	------	1.88
MgO	31.36	31.32	30.56	5.51	6.78	20.89
Na_2O	------	------	------	.63	------	------
K_2O	------	------	------	.85	2.20	------
H_2O at 105°	1.08	1.64	1.56	2.47	3.03	11.23
H_2O above 105°	12.55	16.78	17.05	6.22	7.63	9.96
CO_2	------	------	------	8.21	------	------
	100.31	100.43	100.47	99.79	100.00	100.42

P. Chloritic vermiculite from Corundum Hill, North Carolina.

Q. Altered chlorite from Corundum Hill. Analyses P, Q by T. M. Chatard. Description in Bulletin 42.

	P.	Q.
SiO_2	35.88	32.97
Al_2O_3	20.90	17.88
Fe_2O_3	6.55	4.76
FeO	3.68	.57
MnO	----	trace
CaO	.14	none
MgO	19.90	22.36
Alkalies	traces	undet.
H_2O at 110°	12.71	11.42
H_2O above 110°		10.05
	99.76	100.01

CLINOCHLORE.

A. From Westchester, Pa. Broadly foliated. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

B. From the Nikolai-Maximilian mine, district of Slatoust, Urals, Siberia. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 113.

C. Leuchtenbergite from Slatoust. Analyst and reference as under B.

D. Kotschubeite from Green Valley, American River Canyon, California. Specific gravity, 2.69. Analysis by W. H. Melville. Described by Melville and Lindgren in Bulletin 61.

	A.	B.	C.	D.
SiO_2	29.87	30.84	30.00	31.74
Al_2O_3	14.48	18.31	20.43	6.74
Co_2O_3	1.56	----	----	11.39
Fe_2O_3	5.52	1.94	1.68	----
FeO	1.93	1.08	.14	1.23
NiO	.17	----	----	.49
CaO	----	----	.21	.18
MgO	33.06	34.38	34.26	35.18
H_2O at 105°	13.60	.55	.55	.37
H_2O above 105°		13.33	13.20	12.68
	100.19	100.43	100.47	100.00

PROCHLORITE.

From the Aqueduct Tunnel, Washington, D. C. Analysis by E. A. Schneider. Described by Clarke and Schneider in Bulletin 78.

SiO_2	25.40
Al_2O_3	22.80
Fe_2O_3	2.86
FeO	17.77
MnO	.25
MgO	19.09
H_2O at 105°	.80
H_2O above 105°	11.41
F	trace
	100.38

SERPENTINE.

A. From Newburyport, Mass. Analysis by F. W. Clarke.

B. Same locality as A. Analysis by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 78.

C. Serpentine derived from sahlite, Osburn's soapstone quarry, Blandford, Mass. Analysis by W. F. Hillebrand.

D. Dark-green, oily serpentine, Middlefield, Mass. Analysis by W. F. Hillebrand.

E. Serpentine derived from enstatite, Granville, Mass.

Analysis by George Steiger. Serpentines C, D, E are described by Emerson in Monograph XXIX.

	A.	B.	C.	D.	E.
SiO_2	41.32	41.47	40.77	38.62	37.82
TiO_2			none	none	trace
Al_2O_3			1.16	.35	.61
Cr_2O_3			.28	.39	.19
Fe_2O_3		1.73	3.56	3.44	7.92
FeO	2.36	.09	1.47	3.99	1.15
MnO			.09	.10	
NiO			.17	.21	.45
CoO					.05
CaO		none	none	.40	none
MgO	41.49	41.70	39.37	40.61	37.94
Li_2O			trace	trace	
Na_2O			.14	.10	trace
K_2O			.10	.08	trace
H_2O at 110°	14.54	1.20	.49	.36	.75
H_2O above 110°		13.86	12.48	10.91	12.50
P_2O_5			trace	trace	trace
CO_2			none	.52	
	99.71	100.05	100.08	100.08	99.38

F. Rich, dark-green serpentine, Rowe, Mass.

G. Black serpentine containing marmolite, Atwater's quarry, Russell, Mass.

H. Blackish-green serpentine, containing much chromite, North Blandford, Mass.

I. Gray, splintery serpentine, Chester, Mass. Analyses F to I by George Steiger. Description by Emerson in Monograph XXIX.

J. Black, serpentized boltonite, Stow, Mass. Analysis by W. F. Hillebrand.

	F.	G.	H.	I.	J.
SiO_2	40.42	36.94	39.14	33.87	36.92
TiO_2	none	trace	none	none	none
Al_2O_3	1.86	.50	1.18	.77	.10
Cr_2O_3	.28	.33	.33	.38	none
Fe_2O_3	2.75	6.04	4.46	2.81	1.19
FeO	4.27	1.94	3.14	4.25	.87
MnO	trace	trace	none	.04	trace
NiO	.53	.40	.47	.33	----
CoO	trace	none	trace		----
CaO	.66	none	none	none	.59
MgO	35.95	38.35	41.45	38.57	43.99
Na_2O	.16	none	none	none	.05
K_2O		none	none	none	
H_2O at 100°	.21	.71	.34	.38	.72
H_2O above 100°	10.51	12.07	9.48	7.00	14.70
P_2O_5	trace	trace	.02	trace	trace
CO_2	1.44	1.85	none	10.82	.90
SO_3	trace	.20	none	.20	----
FeS_2	.43	----	----	----	----
	99.47	99.33	100.01	99.42	100.03

K. From Moriah, N. Y. Analysis by Charles Catlett. Described by Merrill, Proc. U. S. Nat. Mus., vol. 12, p. 596.

L. From the aqueduct shaft, New York City. Analysis by Charles Catlett. See Merrill, loc. cit., p. 598.

M. From Montville, N. J., light yellowish-green.

N. From Montville, darker green. Analyses M, N, by Charles Catlett. See Merrill, Proc., U. S. Nat. Mus., vol. 11, p. 105.

O. From Montville, massive.

P. From Montville, chrysotile. Analyses O, P, by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 78.

	K.	L.	M.	N.	O.	P.
SiO_2	39.96	39.92	42.38	40.23	42.05	42.42
Al_2O_3	1.07	.08	.07	2.18	.30	.63
Fe_2O_3	3.53	.50	.97	4.02		.62
FeO	3.85	none	.17	trace?	.10	undet.
MnO	trace					none
NiO	none					.23
CaO	none	.90		trace	.05	trace
MgO	37.61	42.52	42.14	39.46	42.57	41.01
H_2O at 105°	13.65	1.36	14.12	14.24	.96	2.04
H_2O above 105°		13.26			13.70	13.60
CO_2		1.64				
	99.67	100.18	99.85	100.13	99.73	100.55

Q. From Easton, Pa. Resembles a vermiculite. Analysis by E. A. Schneider. See Clarke and Schneider, Bulletin 90.

R. Grayish-green serpentine from Corundum Hill, North Carolina.

S. Picrolite from Buck Creek, Clay County, N. C. Analyses R and S by E. A. Schneider. See Clarke and Schneider, Bulletin 78.

T. From the river Poldnewaja, district of Syssert, Urals, Siberia. Analysis by E. A. Schneider. See Clarke and Schneider, Bulletin 113.

U. From Greenville, Plumas County, Cal. Analysis by W. H. Melville. Described by Diller in Bulletin 150.

	Q.	R.	S.	T.	U.
SiO_2	43.71	41.90	42.94	42.55	39.14
Al_2O_3	3.59	.71	5.05	1.25	2.08
Fe_2O_3	.90	.91		1.56	4.27
FeO	.....	undet.	1.88	1.52	2.04
NiO	.....	.10	.61	.....	.....
CaO	.....	.....	.....	none	trace
MgO	38.58	40.16	36.53	40.05	39.84
Na_2O	.13	.....	.....	.....	.....
K_2O	2.22	.....	.....	.....	.....
H_2O at 105°	.46	2.26	1.53	.21	12.70
H_2O above 105°	10.79	13.90	11.68	12.26	
Chromite	.....	.....	.....	.37	.11
	100.38	99.94	100.22	99.77	100.18

V. Light-green marmolitic serpentine, New Idria, Cal.

W. Black serpentine, Sulphur Bank, California.

X. Light-green serpentine, Sulphur Bank.

Analyses V, W, X by W. H. Melville. Described by Becker in Monograph XIII. Other analyses by Melville of impure serpentines from near Mount Diablo, California, are given in Bulletin 168.

Y. From Three Brothers, Mount Stuart quadrangle, Washington. Analysis by W. F. Hillebrand.

	V.	W.	X.	Y.
SiO_2	41.54	39.64	41.86	39.00
TiO_2				trace
Al_2O_3	2.48	1.30	.69	1.75
Cr_2O_3		.29	.24	.47
Fe_2O_3				5.16
FeO	1.37	7.76	4.15	1.71
MnO		.12	.20	.15
NiO	.04	.38	trace	.10
CaO				trace
MgO	40.42	37.13	38.63	38.00
Alkalies				.10
H_2O at 110°	14.18	13.81	14.16	1.31
H_2O above 110°				12.43
P_2O_5				trace
FeS_2				.03
	100.03	100.38	99.93	100.21

GENTHITE.

From Riddle, Douglas County, Oreg. Analyzed by F. W. Clarke, and described by Diller and Clarke in Bulletin 60.

SiO_2	44.73
Al_2O_3, Fe_2O_3	1.18
MgO	10.56
NiO	27.57
H_2O at 110°	8.87
H_2O above 110°	6.99
	99.90

TALC.

Apple-green, beautifully foliated. From Huntersville, Fairfax County, Va. Analysis by E. A. Schneider.

SiO_2	62.27
Al_2O_3	.15
Fe_2O_3	.95
FeO	.85
MgO	30.95
MnO	trace
H_2O at 105°	.07
H_2O, ignition	4.84
	100.08

GLAUCONITE.

From Big Goose Canyon, 15 miles southwest of Sheridan, Big Horn Mountains, Wyoming. Analysis by George Steiger. Specific gravity, 2.73.

SiO_2	49.23
Al_2O_3	7.11
Fe_2O_3	20.89
FeO	3.06
MnO	trace
CaO	trace
MgO	3.44
Na_2O	.11
K_2O	8.51
H_2O at 100°	1.83
H_2O above 100°	4.88
	99.06

KAOLINITE.

A. From Hockessen, Del. Analysis by George Steiger.

B. From Aiken, S. C. Analysis by F. W. Clarke.

C. From Talladega, Ala. Analysis by Charles Catlett.

D. From the Eureka vein, St. Peter's Dome, near Pikes Peak, Colorado. Analysis by W. F. Hillebrand. Described by Cross and Hillebrand in Bulletin 20.

E. From New Discovery mine, Leadville, Colo. Analysis by W. F. Hillebrand.

F. From National Belle mine, Ouray County, Colo. Analysis by W. F. Hillebrand. Specific gravity, 2.611 at 18.5°. Described in Bulletin 20.

	A.	B.	C.	D.	E.	F.
SiO_2	48.73	45.56	43.21	46.06	43.66	46.35
Al_2O_3	37.02	40.25	37.27	39.63	37.78	39.59
Fe_2O_3	.79					.11
CaO	.16		.11		.22	
MgO	.11		.10		.30	
Na_2O	.04		.40		trace	
K_2O	.41		.28		trace	
H_2O at 100°	.52	14.10	5.02	13.77	17.95	13.93
H_2O above 100°	12.83		13.48			
P_2O_5	.03					
TiO_2	.17					
SO_3					trace	
F						.15
CaF_2				.68		
	100.81	99.91	99.87	100.14	99.91	100.13
O equivalent to F						.06
						100.07

HALLOYSITE.

A. From the Detroit copper mine, near Mono Lake, California. Analyzed by F. W. Clarke, and described in Bulletin 9.

B. From the Logan mine, Rico, Colo. Analysis by W. F. Hillebrand.

	A.	B.
SiO_2	42.91	38.65
Al_2O_3	38.13	33.27
Fe_2O_3		.22
H_2O at 100°	18.95	13.70
H_2O above 100°		14.34
	99.99	100.18

CIMOLITE.

Rose-red, earthy variety, from Norway, Me. Analysis by R. B. Riggs. Described by Clarke in Bulletin 42.

SiO_2	66.86
Al_2O_3	22.23
Fe_2O_3	.47
FeO	.18
MnO	.07
CaO	.42
MgO	.33
Li_2O	.29
Na_2O	.46
K_2O	.18
H_2O	8.26
F	.06
	99.81

PYROPHYLLITE.

Compact, white. From Deep River, North Carolina. Analysis by George Steiger.

SiO_2	64.73
TiO_2	.73
Al_2O_3	29.16
Fe_2O_3	.49
MgO	trace
Ignition	5.35
	100.46

BOLE.

From South Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Dark brown.

B. Light brown.

	A.	B.
SiO_2	42.63	46.17
Al_2O_3	18.76	22.03
Fe_2O_3	11.88	4.64
CaO	2.59	2.30
MgO	3.39	2.42
K_2O	.35	[a] 2.06
Na_2O	.24	
H_2O	20.21	20.38
	100.05	100.00

[a] By difference.

VIII. TITANATES AND TITANO-SILICATES.

ILMENITE.

From the peridotite dike of Elliott County, Ky. Described by Diller in Bulletin 38. Analysis by T. M. Chatard.

TiO_2	49.82
SiO_2	.76
Al_2O_3	2.84
Cr_2O_3	.74
Fe_2O_3	9.13
FeO	27.81
MnO	.20
CaO	.23
MgO	8.68
Alkalies	.19
P_2O_5	trace
Ignitium	.20
	100.10

XANTHITANE.

From Green River, Henderson County, N. C. Alteration product of titanite. Analyzed by L. G. Eakins, and described in Bulletin 60. Specific gravity, 2.941 at 24°. Material dried at 100°.

TiO_2	61.54
SiO_2	1.76
Al_2O_3	17.59
Fe_2O_3	4.46
CaO	.90
MgO	trace
P_2O_5	4.17
H_2O	9.92
	100.34

TITANITE.

Pale-yellow, semi-translucent. From the waterworks tunnel, Washington, D. C. Occurs embedded in prochlorite. Analysis by F. W. Clarke. Specific gravity, 3.452.

TiO_2	40.82
SiO_2	30.10
MnO	trace
CaO	28.08
MgO	.40
Ignition	.54
	99.94

TSCHEFFKINITE.

From Bedford County, Va. Analyzed by L. G. Eakins and described by him in Bulletin 90.

A. Lustrous portion. Specific gravity, 4.33 at 27°.

B. Dull portion. Specific gravity, 4.38 at 22°.2.

	A.	B.
TiO_2	18.78	18.99
SiO_2	20.21	21.49
Ta_2O_5	.08	.08
ZrO_2	trace?	trace?
ThO_2	.85	.75
$(Y, Er)_2O_3$	1.82	1.64
$(La, Di)_2O_3$	19.72	17.16
Ce_2O_3	20.05	19.08
Al_2O_3	3.60	3.65
Fe_2O_3	1.88	2.89
FeO	6.91	5.92
CaO	4.05	5.24
MgO	.55	.48
Na_2O	.06	.04
H_2O	.94	2.06
	99.50	99.47

ASTROPHYLLITE.

From St. Peter's Dome, near Pikes Peak, Colorado. Analyzed by L. G. Eakins and described by him in Bulletin 90.

TiO_2	11.40
SiO_2	35.23
ZrO_2	1.21
Ta_2O_5	.34
Fe_2O_3	3.73
Al_2O_3	trace
FeO	29.02
MnO	5.52
CaO	.22
MgO	.13
K_2O	5.42
Na_2O	3.63
H_2O	4.18
	100.03

IX. COLUMBO-TANTALATES.

SAMARSKITE.

Mineral near samarskite, from Devils Head Mountain, near Pikes Peak, Colorado. Analyzed by W. F. Hillebrand and described in Bulletin 55.

A. Pitch-black variety, streak dirty brown. Specific gravity, 6.18 at 22°.

B. Black, streak salmon colored. Specific gravity, 6.12 at 25°.

C. Altered variety. Specific gravity, 5.45 at 16°.

	A.	B.	C.
Ta_2O_5	27.03	28.11	19.34
Cb_2O_5	27.77	26.16	27.56
WO_3	2.25	2.08	5.51
SnO_2	.95	1.09	.82
ZrO_2	2.29	2.60	[a] 3.10
UO_2	4.02	4.22	----
UO_3	----	----	6.20
ThO_2	3.64	3.60	3.19
Ce_2O_3	.54	.49	.41
$(La, Di)_2O_3$	1.80	2.12	1.44
Er_2O_3	10.71	10.70	9.82
Y_2O_3	6.41	5.96	5.64
Fe_2O_3	8.77	8.72	8.90
FeO	.32	.35	[b] .39
MnO	.78	.75	.77
ZnO	.05	.07	
PbO	.72	.80	1.07
CaO	.27	.33	1.61
MgO	----	----	.11
K_2O	.17	.13	.36
$(Na, Li)_2O$	.24	.17	
H_2O	1.58	1.30	3.94
F	(?)	(?)	(?)
	100.31	99.75	100.18

[a] With TiO_2.

[b] Or 0.74 UO_2.

X. BORATES.

COLEMANITE.

A. Transparent crystal, ordinary type, Death Valley, California.
B, C. Blade-like crystals, Death Valley.
D. Priceite, Curry County, Oreg.
D. Pandermite, Island of Panderma, Black Sea.
Analyses by J. E. Whitfield, with details in Bulletin 55.

	A.	B.	C.	D.	E.
B_2O_3	50.70	49.56	49.62	48.44	48.63
CaO	27.31	27.36	27.40	32.15	32.16
MgO	.10	.25	.26	.....	.....
H_2O	21.87	22.66	22.70	19.42	19.40
SiO_2	.....	.44	.47	.....	.....
	99.98	100.27	100.45	100.01	100.19

ULEXITE.

From Rhodes' Marsh, Esmeralda County, Nev. Analysis by J. E. Whitfield, with description in Bulletin 55.

B_2O_3	43.20
CaO	14.52
Na_2O	10.20
K_2O	.44
H_2O	29.46
SiO_2	.04
SO_3	.28
Cl	2.38
	100.52
O equivalent to Cl	.53
	99.99

LUDWIGITE.

From Morawitza, Banat, Hungary. Analysis by J. E. Whitfield, with description in Bulletin 55.

B_2O_3	12.04
Fe_2O_3	37.93
FeO	15.78
MgO	30.57
MnO	.16
H_2O	3.62
	100.10

WARWICKITE.

From Edenville, Orange County, N. Y. Somewhat contaminated by spinel, from which the warwickite could not be entirely freed. Analysis by J. E. Whitfield. See Bulletin 64.

B_2O_3	18.96
TiO_2	18.68
SiO_2	1.16
Al_2O_3	9.44
FeO	14.23
CaO	.38
MgO	34.41
H_2O	2.80
	100.06

XI. NITRATES.

SODA NITER.

From the Leucite Hills, Wyoming. Analysis by L. G. Eakins. The N_2O_5 was not determined directly, but calculated to satisfy Na_2O+K_2O.

Na_2O	32.09
K_2O	4.97
N_2O_5	61.58
CaO	.24
SO_3	.33
Cl	trace
H_2O	.68
	99.89

NITER.

A. From Utah, exact locality unknown. Analysis by T. M. Chatard.

B. From the Leucite Hills, Wyoming. Analysis by L. G. Eakins, with the N_2O_5 calculated to satisfy the alkalies.

	A.	B.
Insoluble matter	12.12	.....
K_2O	38.38	44.91
Na_2O	.12	.07
N_2O_5	44.30	51.49
SiO_2	.20	.....
Al_2O_3		.....
CaO	1.43	1.09
MgO	trace	.....
NaCl	.08	.....
Cl	.....	.09
SO_3	2.05	1.59
H_2O	1.24	.62
	99.92	99.86

XII. PHOSPHATES.

XENOTIME.

From the gold washings at Brindletown, N. C. Analyses by L. G. Eakins.

A. Green, specific gravity, 4.68 at 24.2°.

B. Brown, specific gravity, 4.46 at 24.4°.

	A.	B.
SiO_2	3.46	3.56
ZrO_2	1.95	2.19
UO_2	4.13	1.73
ThO_2	trace	trace
Al_2O_3	.77	1.57
Fe_2O_3	.65	2.79
$(La,Di)_2O_3$	.93	.77
$(Y,Er)_2O_3$[a]	56.81	55.43
CaO	.21	.19
P_2O_5	30.31	29.78
F	.06	.56
H_2O	.57	1.49
	99.85	100.06

[a] Molecular weight, 200.

APATITE.

Dark-green, massive apatite from the topaz locality at Stoneham, Me. Analysis by J. E. Whitfield. See Bulletin 27. Specific gravity, 3.27.

P_2O_5	40.36
CaO	47.60
MgO	6.08
FeO	1.44
H_2O	.11
Cl	.29
F	6.84
	102.72
Excess O	2.94
	99.78

TRIPLITE.

From a tin mine near Rapid City, S. Dak. Probably identical with Headden's "griphite." Analysis by L. G. Eakins, with description in Bulletin 60.

P_2O_5	39.68
SiO_2	.43
Al_2O_3	8.74
Fe_2O_3	2.36
FeO	1.97
MnO	29.13
CaO	6.72
MgO	trace
Li_2O	.13
Na_2O	5.25
K_2O	trace
H_2O	3.67
CO_2	.26
F	2.35
Cl	.25
	100.94
Excess O	1.05
	99.89

TURQUOISE.

From Los Cerillos, N. Mex. Described by Clarke and Diller in Bulletin 42. Analyses by F. W. Clarke.

A. Bright blue, faintly translucent in thin splinters.

B. Pale blue, with a slight greenish cast. Opaque and earthy in texture. Specific gravity, 2.805.

C. Dark green, opaque.

	A.	B.	C.
P_2O_5	31.96	32.86	28.63
SiO_2	1.15	.16	4.20
Al_2O_3	39.53	36.88	37.88
Fe_2O_3		2.40	4.07
CuO	6.30	7.51	6.56
CaO	.13	.38	undet.
H_2O	19.80	19.60	18.49
	98.87	99.79	99.83

XIII. VANADATES.

DESCLOIZITE.

A. From the Mayflower mine, Bald Mountain mining district, Beaverhead County, Mont. Yellow, friable, not crystallized.

B. From the Commercial mine, Georgetown, N. Mex. Brilliantly crystallized.

C. Cuprodescloizite from the Lucky Cuss mine, Tombstone, Ariz. Specific gravity, 5.88 at 19°.

Analyses by W. F. Hillebrand, with description in Bulletin 64.

	A.	B.	C.
V_2O_5	20.80	20.44	19.79
As_2O_5	.32	.94	1.10
P_2O_5	.27	.26	.19
SiO_2	.18	1.01	.80
CO_2			.82
PbO	55.93	56.01	57.00
ZnO	15.94	17.73	4.19
CuO	1.15	1.05	11.21
FeO	.70	.07	trace
CaO	.10	.04	1.01
MgO	.06	.03	.04
K_2O			.10
Na_2O			.17
H_2O	4.37	2.45	2.50
Cl		.04	.07
	99.82	100.07	98.99

CARNOTITE.

From Montrose County, Colo. See memoir by Hillebrand and Ransome, Am. Jour. Sci., 4th ser., vol. 10, p. 120.

A, B, C. From Copper Prince claim, Roc Creek.

D, E. From Yellow Boy claim, La Sal Creek.

Analyses by W. F. Hillebrand.

	A.	B.	C.	D.	E.
V_2O_5	18.35	18.49	15.76	17.80	18.05
As_2O_5	.25	trace	none	none	none
P_2O_5	.33	.80	.40	trace	.05
SiO_2	.....	.15	.13	5.05	.20
TiO_2	.10	.03	(?)	.....	(?)
CO_2	.33	.56	none	.....	none
SO_3	.12	.....	.18	.....	none
UO_3	52.25	54.89	47.42	52.28	54.00
MoO_3	.23	.18	.18	undet.	.05
CrO_3	trace	.....	.....	.....	.....
Fe_2O_3	1.77	.21	.72	3.36	.42
Al_2O_3	1.08	.09	.08	undet.	.29
PbO	.25	.13	.18	undet.	.07
CuO	.20	.15	.22	.....	trace
CaO	2.85	3.34	2.57	1.85	1.86
SrO	.....	.02	(?)	.....	trace
BaO	.72	.90	.65	3.21	2.83
MgO	.20	.22	.24	.17	.14
Li_2O	none	trace	(?)	trace	trace
Na_2O	.09	.14	.07	.07	.13
K_2O	6.73	6.52	6.57	5.32	5.46
H_2O at 105°	2.59	2.43	1.85	4.52	3.16
H_2O above 105°	3.06	2.11	2.79	3.87	2.21
Insoluble	8.34	7.10	19.00	.....	10.33
	99.84	98.46	99.01	97.50	99.25

XIV. ARSENATES AND ANTIMONATES.

OLIVENITE.

From the American Eagle mine, Tintic mining district, Utah. Described by Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

As_2O_5	40.05
P_2O_5	.06
CuO	55.40
Fe_2O_3	.25
CaO	.16
ZnO	trace
H_2O	3.39
Quartz	.40
	99.71

ERINITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analyses by W. F. Hillebrand.

	A.	B.
As_2O_5	33.53	31.91
P_2O_5	.10	
CuO	57.67	57.51
ZnO	1.06	.59
CaO	.32	.51
MgO	trace	trace
Fe_2O_3	.14	.20
H_2O	7.22	9.15
	100.04	99.87

CLINOCLASITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analyses by W. F. Hillebrand. Specific gravity, 4.38 at 19°.

	A.	B.
As_2O_5	29.59	29.60
P_2O_5	.05	[a].05
SiO_2	.06	[a].06
CuO	62.34	62.54
ZnO	.06	.04
Fe_2O_3	.12	.12
H_2O	7.73	7.72
	99.95	100.13

[a] Assumed the same as in A.

CONICHALCITE.

From the American Eagle mine, Tintic district, Utah. Analysis by W. F. Hillebrand, with description in Bulletin 20.

As_2O_5	39.94
P_2O_5	.14
CO_2 (by difference)	.97
CuO	28.68
ZnO	2.86
CaO	19.79
MgO	.54
Fe_2O_3	.36
Ag	.30
H_2O	5.52
Quartz	.90
	100.00

TYROLITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analyses by W. F. Hillebrand. Specific gravity, 3.27 at 20°.5.

	A.	B.
As_2O_5	28.78	26.22
P_2O_5	trace	trace
CuO	45.22	46.38
ZnO	.04	trace
CaO	6.84	6.69
MgO	.05	.04
H_2O	17.26	17.57
SO_3	(?)	2.27
	98.19	99.17

CHENEVIXITE.

From the American Eagle mine, Tintic district, Utah. Analyzed by W. F. Hillebrand and described in Bulletin 20.

As_2O_5	35.14
CuO	26.31
CaO	.44
MgO	.16
Fe_2O_3	27.37
Al_2O_3	.66
H_2O	9.33
Quartz	.40
	99.81

MIXITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analysis by W. F. Hillebrand.

As_2O_5	28.79
P_2O_5	.06
SiO_2	.42
CuO	43.89
ZnO	2.70
CaO	.26
Bi_2O_3	11.18
Fe_2O_3	.97
H_2O	11.04
	99.31

SCORODITE.

An incrustation on hot spring deposits, from Joseph's Coat Spring, Broad Creek, Yellowstone Park. Analyzed by J. E. Whitfield and described in Bulletin 55.

As_2O_5	46.48
Fe_2O_3	33.29
H_2O	15.50
SiO_2	4.35
SO_3	.84
	100.46

BINDHEIMITE.

From a claim near the Bertrand mine, Secret Canyon, Nevada. Analyzed by W. F. Hillebrand and described in Bulletin 20. Specific gravity, 5.01 at 19°, after correction for admixed quartz and cerussite.

Sb_2O_5	35.20
PbO	49.50
CuO	.58
ZnO	.18
CaO	.66
MgO	.03
K_2O	.14
Na_2O	.21
Fe_2O_3	.09
Ag	.29
CO_2	3.35
H_2O	5.86
Quartz	4.59
	100.68

XV. SULPHATES AND TELLURITES.

GYPSUM.

A. From Hillsboro, New Brunswick. Analysis by George Steiger.

B. From the Western Plaster Works, Alabaster, Mich. Analysis by George Steiger.

C. From east of Cascade, Black Hills, South Dakota. Analysis by George Steiger.

D. From Rico-Aspen mine, Rico district, Colorado. Analysis by W. F. Hillebrand.

E, F. From Nephi, Utah. Analyses by E. T. Allen. Some anhydrite must be present.

	A.	B.	C.	D.	E.	F.
SO_3	46.18	46.18	45.45	45.07	48.14	39.53
CO_2			.85	1.54	.65	7.73
Cl	trace	.03			trace	.04
SiO_2			.10	.51		
TiO_2				trace		
Al_2O_3	.10	.08	.12	.03		.14
Fe_2O_3				.09		
CaO	32.37	32.33	32.44	32.49	35.29	38.46
SrO				.10		
MgO	trace	.05	.33	.92	trace	.24
Na_2O	.10	.14		trace		.07
K_2O						.19
H_2O	20.94	20.96	20.80	19.67	15.88	12.69
Insoluble	.10	.05				.45
Organic matter				present		
	99.79	99.82	100.09	100.42	99.96	99.54

BROCHANTITE.

From the United Verde mine, Jerome, Ariz. Analysis by W. F. Hillebrand.

SO_3	16.75
CuO	69.45
PbO	.04
Fe_2O_3 (from gangue)	.28
CaO	trace
H_2O	12.05
P_2O_5	trace
CO_2	.71
Insoluble	.70
	99.98

ANTLERITE.

From the Antler mine, Yucca Station, Mohave County, Ariz. Described by Hillebrand as a new species in Bulletin 55. Specific gravity, 3.93 at 16°, corrected for gangue. Analyses by W. F. Hillebrand.

A, B. First lot received.

C. Later sample.

	A.	B.	C.
SO_3	18.78	18.48	20.11
CuO	62.48	62.69	63.26
ZnO	.27	.27	.04
CaO	.06	.05	.04
MgO	.03	.03	.....
Al_2O_3, Fe_2O_3	.14	.12	.15
SiO_2	.06	undet	.05
H_2O	10.21	10.18	10.05
Insoluble gangue	8.01	8.02	6.27
	100.04	99.84	99.97

PISANITE.

From Bingham, Utah. Analysis by W. F. Hillebrand.

SO_3	28.52
CuO	12.60
FeO	14.13
ZnO	.10
H_2O	44.92
	100.27

PICRALLUMOGENE.

From near Las Vegas, N. Mex. Analysis by W. F. Hillebrand.

SO_3	37.51
Al_2O_3	9.71
MnO	.06
MgO	6.75
Na_2O	2.09
K_2O	.28
H_2O	43.75
	100.15

HALOTRICHITE.

From the headwaters of Gila River, Grant County, N. Mex., about 40 miles north of Silver City. Analyzed by F. W. Clarke, and described in Bulletin 9.

SO_3	37.19
Al_2O_3	7.27
FeO	13.59
H_2O	40.62
Insoluble	.50
	99.17

ALUNOGEN.

A. From headwaters of Gila River, Grant County, N. Mex., about 40 miles north of Silver City. Analyzed by F.W. Clarke, and described in Bulletin 9. Color, pinkish.

B. From the calcite spring, Yellowstone Park. Fine, white, silky fibers. Analysis by J. E. Whitfield.

C. From the Grand Canyon, Yellowstone Park. Analysis by J. E. Whitfield.

	A.	B.	C.
SO_3	34.43	40.65	38.22
Al_2O_3	15.52	15.72	16.80
Fe_2O_3	.....	trace	trace
CaO	.....	trace	none
MgO	.....	1.53	.18
K_2O	.....	.....	.01
Na_2O	.....	.....	.63
H_2O	42.56	41.81	43.64
SiO_2	.....	.09	1.38
Insoluble	7.62	.....	.....
	100.13	99.80	100.86

COPIAPITE.

A. From the Redington mine, Knoxville, Cal.

B. From Sulphur Bank, Lake County, Cal.

Analyses by W. H. Melville. Description by Melville and Lindgren in Bulletin 61.

	A.	B.
SO_3	39.97	38.82
Al_2O_3	.....	.37
Fe_2O_3	26.54	26.79
FeO	.46	3.28
MnO	.21	trace
CaO	.....	.25
MgO	3.06	.16
H_2O	30.43	29.58
Residue	.....	.75
	100.67	100.00

KNOXVILLITE.

From the Redington mine, Knoxville, Cal. Described as a new species by Melville and Lindgren in Bulletin 61. Analysis by W. H. Melville.

SO_3	35.91
Cr_2O_3	7.41
Al_2O_3	4.83
Fe_2O_3	15.36
FeO	3.81
NiO	.83
MgO	3.22
H_2O at 100°	9.30
H_2O above 100°	17.60
Residue	1.73
	100.00

REDINGTONITE.

From the Redington mine, Knoxville, Cal. Described as a new species by Melville and Lindgren in Bulletin 61. Analysis by W. H. Melville. Specific gravity, 1.761.

SO_3	35.35
Cr_2O_3	7.51
Al_2O_3	5.14
Fe_2O_3	.19
FeO	4.58
NiO	1.00
MnO	trace
MgO	1.85
H_2O at 100°	27.09
H_2O above 100°	14.34
Residue	3.46
	100.51

ALUNITE.

A. From Knickerbocker Hill, Custer County, Colo. Analysis by L. G. Eakins.

B. From Tres Cerritos Buttes, southwest of Indian Gulch, Mariposa County, Cal. Analysis by William Valentine.

	A.	B.
SO_3	35.91	38.50
Al_2O_3	38.91	38.05
Fe_2O_3	.....	.23
CaO	.35	.55
MgO	trace	trace
K_2O	4.03	4.48
Na_2O	4.32	2.78
H_2O	13.03	11.92
SiO_2	2.82	2.64
TiO_2	.....	.40
P_2O_5	.....	trace
	99.37	99.55

JAROSITE.

A. From Black Iron mine, Eagle County, Colo.

B. From Pigeon mine, Rico district, Colorado.

Analyses by W. F. Hillebrand.

	A.	B.
SO_3	30.72	28.20
Fe_2O_3	46.37	43.81
PbO	1.80	.....
MgO	trace	trace
CaO	.....	.06
K_2O	8.14	7.44
Na_2O	.27	.08
H_2O	11.40	11.64
Al_2O_3	.....	1.00
P_2O_5	.....	.33
As_2O_5	.51	.....
SiO_2	.72	7.35
	99.93	99.91

NATROJAROSITE.

From Soda Springs Valley, on road from Sodaville to Vulcan copper mine, Nevada. Described by Hillebrand and Penfield in Am. Jour. Sci., 4th ser., vol. 14, p. 211. Analysis by W. F. Hillebrand. Specific gravity, 3.18 at 30.5°.

SO_3	30.96
Fe_2O_3	50.98
CaO	.04
K_2O	.35
Na_2O	6.03
H_2O at 105°	.12
H_2O above 105°	11.03
SiO_2	.23
As_2O_5	.20
	99.94

PLUMBOJAROSITE.

From Cooks Peak, New Mexico. Described as a new species by Hillebrand and Penfield in Am. Jour. Sci., 4th ser., vol. 14, p. 211. Analysis by W. F. Hillebrand. Specific gravity, 3.668 at 30.5°.

SO_3	27.06
Fe_2O_3	42.37
Al_2O_3?	.10
PbO	19.84
CuO	.27
CaO	.05
MgO	.01
K_2O	.17
Na_2O	.21
H_2O at 105°	.02
H_2O above 105°	9.54
SiO_2	.51
	100.15

EMMONSITE.

A hydrous ferric tellurite from near Tombstone, Ariz. Analyzed partially by W. F. Hillebrand, and described by him as a new species in Proc. Colorado Sci. Soc., vol. 2, pt. 1, p. 21. The data relative to the composition of emmonsite are as follows:

	I.	II.	III.	IV.
Te(Se)	59.77	59.15	59.05	59.14
Fe	14.00	14.06	14.90	14.20
ZnO				1.94
CaO				.56
H_2O	3.28			

XVI. MOLYBDATES, TUNGSTATES, AND URANATES.

POWELLITE.

From the Seven Devils mining district, Idaho. Analyzed by W. H. Melville, and described by him as a new mineral species in Bulletin 90. Specific gravity, 4.526.

MoO_3	58.58
WO_3	10.28
CaO	25.55
MgO	.16
Fe_2O_3	1.65
Al_2O_3	trace
CuO	trace
SiO_2	3.25
S	undet.
	99.47

HÜBNERITE.

From the Royal Albert vein, Uncompahgre district, Ouray County, Colo. Analyzed by W. F. Hillebrand, and described by him in Bulletin 20. Specific gravity, 7.177 at 24°.

WO_3	75.58
Cb_2O_5 (?)	.05
SiO_2	.62
MnO	23.40
FeO	.24
CaO	.13
	100.02

URANINITE.

Analyses by W. F. Hillebrand. Discussed in Bulletins 78 and 90. In the original publications the gaseous constituent of uraninite was supposed to be nitrogen; as indeed it was in part. The discovery of helium, however, has shed new light upon the subject, and the analyses have been corrected accordingly,

A, B, C, D, E. Crystallized uraninite from Hale's quarry, Glastonbury, Conn. Nitrogen was certainly present in these specimens.

	A.	B.	C.	D.	E.
UO_3	22.08	23.35	22.22	26.48	23.03
UO_2	59.13	58.01	59.31	57.43	59.93
ThO_2		9.78		9.79	
CeO_2				.25	
ZrO_2?	9.57		10.31		11.10
$(LaDi)_2O_3$		.46		.13	
$(YEr)_2O_3$				.20	
PbO	3.14	3.24	3.07	3.26	3.08
CaO	.08		undet.	.08	.11
MgO			undet.		
Alkalies			undet.	trace	
H_2O	.97	undet.	undet.	.61	.43
He, etc	undet.	undet.	undet.	undet.	.34
Fe_2O_3	1.21	.33	.67	.40	.29
MnO				trace	
SiO_2	1.06		.25	.16	.16
P_2O_5					.02
F					.04
Insoluble	.85	1.74	.42	.70	.89
Cb_2O_5	.96				
	99.05	96.91	96.25	99.49	99.42
Specific gravity	9.139	9.051		9.587	9.622

F, G, H. Brilliantly crystallized, from Branchville, Conn.

I, J. Altered uraninite, from the Flat Rock mine, Mitchell County, N. C.

K. Massive, from near Blackhawk, Colo.

L. From Marietta, S. C.

	F.	G.	H.	I.	J.	K.	L.
UO_3	13.27	21.54	14.00	50.83	44.11	25.26	83.95
UO_2	72.25	64.72	70.99	39.31	46.56	58.51	
TiO_2						trace	
ZrO_2	7.20	.33	6.52			7.59	.20
ThO_2		6.93		2.78			1.65
CeO_2				.26	3.04	.22	.19
$(LaDi)_2O_3$				.50			2.05
$(YEr)_2O_3$				.20			6.16
PbO	4.35	4.34	4.35	4.20	4.53	.70	3.58
ZnO						.44	
FeO				trace		.32	
Fe_2O_3	.11	.28	.27				trace
MnO	.10	.07	(?)			.16	
CaO	.18	.22	.30	.85	.23	.84	.41
MgO			.15	.30	.25	trace?	trace
Alkalies						trace?	trace
H_2O	.68	.67	.68	1.21	undet.	1.96	undet.
He, etc	undet.	undet.	.38	.05	undet.	.02	undet.
SiO_2	.03	.13	.20	.08	.13	2.79	
P_2O_5				(?)		.22	
As_2O_5						.43	
$CuFeS_2$						.12	
FeS_2						.24	
Insoluble	.04	.14	1.40	.10	.06		.20
	98.21	99.37	99.24	100.67	98.91	99.82	98.39
Specific gravity	9.733	9.560	9.348	8.086	9.492	8.068	

M. Nivenite from Llano County, Tex.

N. Somewhat altered uraninite from Villeneuve, Province of Quebec, Canada.

O. Massive uraninite from Johanngeorgenstadt, Saxony.

	M.	N.	O.
UO_3	20.89	34.67	22.33
UO_2	44.17	41.06	59.30
ThO_2	6.69	6.41	
ZrO_2	.34	(?)	
CeO_2	.34	.40	none
$(La, Di)_2O_3$	2.36	1.11	
$(Y, Er)_2O_3$	9.46	2.57	
CaO	.32	.39	1.00
PbO	10.08	11.27	6.39
H_2O	1.48	1.47	3.17
He, etc	.08	.10	trace
SiO_2	.46	.19	.50
Fe_2O_3	.14	.10	.21
Al_2O_3 ?			.20
MgO			.17
Na_2O			.31
Bi_2O_3		.09	.75
CuO			.17
MnO			.09
P_2O_5			.06
As_2O_5			2.34
V_2O_5, MoO_3, WO_3			.75
SO_3			.19
Insoluble	1.47	.13	
	98.28	99.96	97.93
Specific gravity	8.29		6.89

The following uraninites are all from Norway, and were analyzed for comparison with the American material.

P. Bröggerite from Anneröd, near Moss. Specific gravity, 8.893.
Q. From Elvestad. Specific gravity, 9.145.
R. From Elvestad. Specific gravity, 8.320.
S. From Skraatorp. Specific gravity, 8.966.
T. From Huggenäskilen. Specific gravity, 8.930.
U. Cleveite from Arendal. Specific gravity, 7.500.
V. From Arendal.

	P.	Q.	R.	S.	T.	U.	V.
UO_3	30.63	25.36	22.04	32.00	35.54	41.71	26.80
UO_2	46.13	50.74	43.03	43.88	43.38	24.18	44.18
ZrO_2?	.06	.08					
ThO_2	6.00	8.48		8.98	6.63	3.66	4.15
CeO_2	.18	.21	8.43	.17	.20		none
$(La, Di)_2O_3$	.27	.26		.36	.23		.67
$(Y, Er)_2O_3$	1.11	1.10		.97	1.03	9.76	9.05
PbO	9.04	10.06	8.58	9.46	9.44	10.54	10.95
CaO	.37	.77	.37	.36	.41	1.06	.61
MgO	traces	traces	.13	traces	.13	.10	.04
Alkalies						.23	.15
H_2O	.74	.73	.74	.77	.79	1.23	undet.
He, etc	.17	.18	.15	.15	.15	undet.	.18
Fe_2O_3	.25	.21	.30	.09	.32	.03	.24
MnO		.06					
SiO_2	.22	.38	.29	.53	.49	.90	.50
P_2O_5	.03	.04	trace	(?)	trace		trace
Insoluble	4.42	.45	15.45	1.54	.42	1.10	1.19
	99.61	99.11	99.51	99.26	99.16	94.50	98.71

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O

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Bulletin No. 220.]

The serial publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of the United States—folios and separate sheets thereof, (8) Geologic Atlas of the United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

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B 220. Mineral analyses from the laboratories of the United States Geological Survey, 1880 to 1903, tabulated by F. W. Clarke, chief chemist. 1903. 119 pp.

Correspondence should be addressed to—

THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

NOVEMBER, 1903.

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Bulletin No. 221 Series G, Miscellaneous, 25

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

BIBLIOGRAPHY AND INDEX

OF

NORTH AMERICAN GEOLOGY, PALEONTOLOGY PETROLOGY, AND MINERALOGY

FOR

THE YEAR 1902

BY

FRED BOUGHTON WEEKS

WASHINGTON
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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., October 20, 1903.

SIR: I have the honor to transmit herewith the manuscript of a bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1902, and to request that it be published as a bulletin of the Survey.

Very respectfully,

F. B. WEEKS.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

BIBLIOGRAPHY AND INDEX OF NORTH AMERICAN GEOLOGY, PALEONTOLOGY, PETROLOGY, AND MINERALOGY FOR THE YEAR 1902.

By FRED BOUGHTON WEEKS.

INTRODUCTION.

The arrangement of the material of the Bibliography and Index for 1902 is similar to that adopted for the previous publications (Bulletins Nos. 130, 135, 146, 149, 156, 162, 172, 188, 189, and 203). Several papers that should have been entered in the previous bulletins are here recorded, and the date of publication is given with each entry.

Bibliography.—The bibliography consists of full titles of separate papers, arranged alphabetically by authors' names, an abbreviated reference to the publication in which the paper is printed, and a brief description of the contents, each paper being numbered for index reference.

Index.—The subject headings, their subdivisions and arrangement, are shown in the classified key to the index, which immediately precedes the index. Reference is made in each entry by author's name and number of article in the bibliography.

Mr. John M. Nickles has assisted in the compilation of this work, and credit is due him for its careful preparation and completeness

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197 —— Vermilion district of Minnesota.
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201 —— Nepheline and other syenites near Port Coldwell, Ontario.
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202 —— The duration of the Toronto inter-Glacial period.
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Reviews a recent paper by Upham and discusses the evidences indicating the duration of this period.

203 —— The Huronian question.
Am. Geol., vol. 29, pp. 327–334, 1902.
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204 —— Rock basins of Helen mine, Michipicoten, Canada.
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209 **Collier** (Arthur J.). A reconnaissance of the northwestern portion of Seward Peninsula, Alaska.
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210 —— See Brooks (Alfred H.), 132.

211 **Collins** (Arthur L.). [In discussion of "The origin of ore-deposits."]
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216 **Crane** (W. R.). The Kansas coal mines of the Missouri Valley.
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218 —— Volcanoes and earthquakes in Nicaragua.
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219 —— List of the most important volcanic eruptions and earthquakes in western Nicaragua within historic time.
Am. Geol., vol., 30, pp. 111–113, 1902.

220 —— Additions to the list of Nicaragua volcanic eruptions in historic time.
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This paper is no. 175 of U. S. Geol. Surv., Bull. no. 203.

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Tech. Quart., vol. 15, pp. 161–180, figs 1–8, 1902.
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226 **Cross** (Whitman). Geologic formations versus lithologic individuals.
Jour. Geol., vol. 10, pp. 223–244, 1902.
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227 —— Systematic petrography.
Jour. Geol., vol. 10, pp. 332–376, 451–499, 1902.
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238 —— The Grand Gulf formation.
Science, new ser., vol. 16, pp. 946–947, 1902.
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239 **Daly** (Reginald A.). The geology of the northeast coast of Labrador.
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240 —— The geology of the region adjoining the western part of the International Boundary.
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242 —— Stratigraphy of the Big Horn Mountains.
Abstract: Science, new ser., vol. 15, p. 823, 1902.

243 —— Preliminary list of deep borings in the United States. Part I.– Alabama–Montana.
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246 —— Oelrichs Folio—South Dakota–Nebraska.
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252 —— Les enseignements du Grand Canyon du Colorado.
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258 —— The walls of the Colorado Canyon.
Abstract: Science, new ser., vol. 15, p. 87, 1902.

259 —— The effect of the shore line on waves.
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Science, new ser., vol. 15, pp. 154–156, 1902.
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261 —— Current notes on physiography.
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262 —— Current notes on physiography.
Science, new ser., vol. 16, pp. 636–637, 1902.
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Science, new ser., vol. 16, pp. 748–749, 1902.
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265 —— Current notes on physiography.
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273 **Dean** (Bashford). Historical evidence as to the origin of the paired limbs of vertebrates.
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274 —— Biometric evidence in the problem of the paired limbs on the vertebrates.
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275 —— The preservation of muscle-fibres in sharks of the Cleveland shale.
Am. Geol., vol. 30, pp. 273–278, pls. viii–ix, 1902.
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276 —— [Review of] 'Bibliography and Catalogue of the Fossil Vertebrata of North America' by Oliver Perry Hay.
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277 **Dennis** (W. B.). A borax mine in southern Oregon.
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278 **Dickson** (C. W.). The concentration of barium in limestone.
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279 **Diller** (Joseph Silas). The copper region of northern California.
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282 —— The wreck of Mt. Mazama [Oregon].
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Sketches the geologic history and formation of the Cascade Range, describes the formation and wrecking of Mt. Mazama, and discusses the evidences for the manner of its wrecking.

283 —— Volcanic dust from Guatemala.
Abstract: Science, new ser., vol. 16, p. 1029, 1902.

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288 **Dodge** (R. E.), and others. New York City Folio—New York–New Jersey.
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293 —— The discovery of Torrejon mammals in Montana.

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294 **Dowling** (D. B.). The west side of James Bay.

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295 **Dresser** (John A.). A petrographical contribution to the geology of the eastern townships of the Province of Quebec.

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296 —— The copper-bearing volcanic rocks in the eastern townships of the Province of Quebec.

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297 —— Petrography of Sheffield and Brome Mountains [Canada].

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298 **Duerden** (J. E.). Aggregated colonies in Madreporarian corals.

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299 —— Boring algæ as agents in the disintegration of corals.

Am. Mus. Nat. Hist., Bull., vol. 16, pp. 323–332, pl. xxxii, 1902.

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300 —— Relationships of the Rugosa (Tetracoralla) to the living Zoantheæ.

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304 **Dumble** (Edwin T.). Notes on the geology of southeastern Arizona.
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306 —— A Carboniferous coal in Arizona.
Am. Geol., vol. 30, p. 270, 1902.
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307 —— The Tertiary of the Sabine River.
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309 —— Cretaceous and later rocks of Presidio and Brewster counties [Texas].
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318 —— and **Barbour** (E. H.). Synopsis of the Missourian and Permo-Carboniferous fish fauna of Kansas and Nebraska.
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320 **Eavenson** (H. N.). The Connellsville region. Its mineral resources—the extent of territory—the methods of mining and amount of output.
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574 —— Geological age of certain gypsum deposits.
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737 —— **Clark** (William Bullock) and. Correlation of the Coal Measures of Maryland.
See Clark (W. B.) and Martin (G. C.), 178.

738 **Mathews** (Edward Bennett). The mineral resources of Cecil County [Maryland].
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750 —— See Bailey (L. W.), 43.

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752 —— A skull of Dinocyon from the Miocene of Texas.
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753 —— On the skull of Bunælurus, a musteline from the White River Oligocene.
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754 —— New Canidæ from the Miocene of Colorado.
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799 **Newton** (R. Bullen). List of Thomas Say's types of Maryland (U. S.) Tertiary mollusca in the British Museum.
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803 **Nickles** (John M.). Geological section—St. Louis to Shawneetown [Illinois].
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805 —— The geology of Cincinnati.
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806 —— Description of a new bryozoan "Homotrypa bassleri," n. sp., from the Warren beds of the Lorraine group.
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811 —— Natronsalpeter in California.
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Jour. Geol., vol. 10, pp. 397–412, 1 pl., 1902; Columbia Univ., Geol. Dept., Contrib., vol. 10, no. 84, 1902.
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813 —— An analcite-bearing camptonite from New Mexico.
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815 —— The mineral wealth of the Black Hills [South Dakota].
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819 —— The mining district of Pachuca, Mexico.
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822 **Osann** (A.). Notes on certain Archæan rocks of the Ottawa Valley [Canada].
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823 **Osborn** (Henry Fairfield). Homoplasy as a law of latent or potential homology.
Am. Nat., vol. 36, pp. 259–271, figs. 1–6, 1902.
Discusses the independent evolution of identical structures in teeth of different families of mammals as a form of homology which has heretofore been defined as homoplasy.

824 —— The law of adaptive radiation.
Am. Nat., vol. 36, pp. 353–363, figs. 1–3, 1902.
Quotes from the author's previous papers bearing upon this law and shows how it is exhibited in the geographic distribution of orders and families and in related contemporaneous forms.

825 —— Dolichocephaly and brachycephaly in the lower mammals.
Am. Mus. Nat. Hist., Bull., vol. 16, pp. 77–89, figs. 1–5, 1902.
Discusses these factors in cranial evolution and their correlation with similar ones in the trunk and limbs.

826 —— The four phyla of Oligocene Titanotheres. Titanothere contributions, no. 4.
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827 —— American Eocene Primates and the supposed rodent family Mixodectidae.
Am. Mus. Nat. Hist., Bull., vol. 16, pp. 169–214, figs. 1–40, 1902.
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828 —— Distinctive characters of the Mid-Cretaceous fauna.
Can. Geol. Surv., Contr. to Can. Paleont., vol. 3, pt. 2, pp. 5–21, 1902.
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1892	1893	1894	1895	1896	1897	1898	1899
681	543	540	193	198	199	50	250
	682	1025	194	932	491	51	251
		1191	479	933	776	52	781
			541		1188	53	820
			683		1189	175	894
			803			337	996
			804			379	
			1039			438	
			1134			844	
			1192			895	
						1056	
						1167	

1900	1901				
103	4	332	568	715	897
107	7	354	569	720	927
143	16	366	582	721	936
387	17	380	589	741	938
388	41	423	590	742	941
389	42	439	591	743	960
527	44	453	592	744	989
528	64	454	600	745	992
810	69	455	602	751	1009
837	96	456	606	762	1020
845	98	465	637	775	1046
894	132	466	638	783	1057
906	142	473	646	784	1058
926	148	482	647	807	1063
948	236	492	648	814	1082
1019	252	493	660	817	1083
1026	267	499	687	832	1086
1027	269	512	696	858	1095
	270	514	698	860	1122
	271	529	700	882	1168
	321	542	701	884	1182
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Arcadia clays, Tertiary, Louisiana, Lerch, 682.
Arietina formation, Cretaceous, Texas, Dumble, 309.
Arikaree formation, Tertiary, Wyoming, Nebraska, Adams, 8.
Arkadelphia beds, Cretaceous, Texas, Hill, 499.
Arkansan series, Carboniferous, Arkansas, Keyes, 568.
Arlington diabase, Juratrias, New Jersey, Merrill, 770.
Armuchee chert, Devonian, Georgia, Hayes, 475.
Arundel formation, Cretaceous, Maryland, Clark and Bibbins, 176.
Atoka formation, Carboniferous, Indian Territory, Taff, 1006.
Atwell sand, Devonian, Pennsylvania, Fuller, 395.
Austin chalk, Cretaceous, Texas, Dumble, 309.
Austin chalk, Cretaceous, Texas, Hill, 499.
Austin chalk, Cretaceous, Texas, Hill and Vaughan, 505.
Austin chalk, Cretaceous, Texas, Prather, 861.
Bangor limestone, Carboniferous, Georgia, Hayes, 475.
Barclay limestone, Carboniferous, Kansas, Beede, 76.
Barnegat limestone, Cambro-Silurian, New York, Eckel, 322.
Barstow series, Tertiary, California, Hershey, 485.
Basal limestone, Carboniferous, Texas, Hill, 499.
Batesville sandstone, Carboniferous, Arkansas, Adams, 7.
Bath-reef series, West Indies, Spencer, 987.
Baucari division, Tertiary, Arizona, Dumble, 304.
Beaver limestone, Cambrian, Alabama, Hayes, 475.
Beekmantown, Ordovician, Vermont, Perkins, 850.
Bell shale, included in Traverse group, Devonian, Michigan, Grabau, 417.
Bellevue beds, Ordovician, Ohio and Indiana, Nickles, 805.
Bellvale flags, Devonian, New York, Eckel, 322.
Bellvale flags, Devonian, New Jersey, Kümmel and Weller, 609.
Bennington limestone, Cretaceous, Indian Territory, Taff, 1006.
Benton, Cretaceous, Montana, Willis, 1144.
Benton formation, Cretaceous, North Dakota, Babcock, 40.

Geologic formations—Continued.
Benton group, Cretaceous, Kansas, Lindgren, 691.
Benton sand, Tertiary, Missouri, Marbut, 783.
Benton shales, Jurassic, Colorado, Hatcher, 456.
Berea Grit, Carboniferous, Ohio, Bownocker, 108.
Bergman series, Cretaceous?, Alaska, Schrader, 942.
Bergman series, probably Mesozoic, Alaska, Mendenhall, 763.
Berkeleyan series, California, Lawson and Palache, 666.
Big Injun series, Carboniferous, Ohio, Bownocker, 108.
Black River limestone, Ordovician, Canada, Ells, 333, 334.
Black River limestone, Ordovician, Vermont, Perkins, 850.
Blacktail Deer Creek beds, Tertiary, Douglass, 291.
Blossburg formation, Devonian, Pennsylvania, Fuller, 395.
Boggy formation, Carboniferous, Indian Territory, Taff, 1007.
Boggy shale, Carboniferous, Indian Territory, Taff, 1006.
Boise granite, Archean, Idaho, Russell, 1022.
Bokchito formation, Cretaceous, Indian Territory, Taff, 1006.
Boone formation, Carboniferous, Arkansas, Adams, 7.
Boscabel bowlder beds, Triassic, Virginia, Woodworth, 1179.
Boston group, Carboniferous, Arkansas, Adams, 7.
Bradford schist, Ordovician, Vermont, Richardson, 896.
Brazil formation, Carboniferous, Indiana, Fuller and Ashley, 397.
Brownstown beds, Cretaceous, Texas, Hill, 499.
Brownwood division (Canyon division), Carboniferous, Texas, Hill, 499.
Brule clay, Tertiary, South Dakota, Darton, 246.
Brule formation, Tertiary, Wyoming, Nebraska, Adams, 8.
Buda formation, Cretaceous, Texas, Hill, 499.
Buda limestone, Cretaceous, Texas, Hill and Vaughan, 505.
Burlingame limestone and shale, Carboniferous, Kansas, Prosser, 877.
Burlingame shales, Carboniferous, Kansas, Beede, 76.
Burlington limestone, Carboniferous, Missouri, Adams, 7.
Caddo limestone, Cretaceous, Indian Territory, Taff, 1006.
Calciferous formation, Ordovician, Canada, Ells, 334.
Calhoun shales, Carboniferous, Kansas, Beede, 76.
Campan series, Pliocene, Tertiary, California, Lawson and Palache, 666.
Geologic formations—Continued.
Caney shale, Carboniferous, Indian Territory, Taff, 1006.
Canyon division, Carboniferous, Texas, Taff, 1007.
Carlile formation, Cretaceous, South Dakota, Darton, 246.
Carmichael clay, Quaternary, Pennsylvania, Campbell, 158.
Cason shale, Upper Silurian, Arkansas, Adams, 7.
Castle conglomerate, Colorado, Lee, 671.
Catskill formation, Devonian, Pennsylvania, Campbell, 158.
Catskill formation, Devonian, Pennsylvania, Fuller, 395, 396.
Cavanal (Cavaniol) group, Carboniferous, Indian Territory and Arkansas, Taff, 1007.
Cedar Creek beds, Tertiary, Colorado, Matthew, 751.
Cemetery limestone, Cambrian, Montana, Weed, 1095.
Chadron formation, Tertiary, Wyoming, Adams, 8.
Chadron sand, Tertiary, South Dakota, Darton, 246.
Charleston sandstone, Carboniferous, West Virginia, Campbell, 157.
Chase stage, Carboniferous, Kansas, Prosser, 877.
Chattanooga shale, Devonian, Georgia, Hayes, 475.
Chazy, Ordovician, Vermont, Perkins, 850.
Chazy formation, Ordovician, Canada, Ells, 334.
Chazy limestone, Ordovician, Canada, Ells, 333.
Chazy shales, Ordovician, Canada, Ells, 333.
Chemung formation, Devonian, Pennsylvania, Fuller, 395.
Cherokee shale, Carboniferous, Kansas, Iowa, Bain, 45.
Cherokee shales, Carboniferous, Missouri, Adams, 7.
Chesapeake formation, Tertiary, Virginia, North Carolina, Darton, 245.
Chickamauga limestone, Silurian, Alabama and Georgia, Hayes, 475.
Chickachoc chert, Carboniferous, Indian Territory, Taff, 1006.
Chico beds, Cretaceous, Oregon, Knowlton, 599.
Chico sandstones, Cretaceous, California, Lawson and Palache, 666.
Chocolate limestone, Carboniferous, Kansas, Beede, 76.
Chouteau formation, Carboniferous, Mississippi Valley region, Keyes, 578.
Chouteau limestones, Carboniferous, Missouri, Adams, 7.
Cincinnati or Hudson group, Silurian, Illinois, Alden, 15.
Cincinnati period, Ordovician, Ohio and Indiana, Nickles, 805.
Cisco division, Carboniferous, Texas, Taff, 1008.
Claiborne, Tertiary, Louisiana, Lerch, 682.

Geologic formations—Continued.
Claiborne, Lower, Eocene, Tertiary, Louisiana, Veatch, 1072, 1073.
Claiborne formation, Tertiary, Louisiana, Lerch, 681.
Clark formation, Carboniferous, West Virginia, Campbell, 157.
Clarno formation, Oregon, Knowlton, 599,
Clear Fork formation, Carboniferous, Texas, Hill, 499.
Clinton, Silurian, Ohio, Bownocker, 108.
Coal Measures, Carboniferous, Maryland. Includes Pottsville, Allegheny, Conemaugh, Monongahela, and Dunkard formations, Clark and Martin, 178.
Coal Measures, Carboniferous, Ohio, Bownocker, 108.
Coaledo formation, Tertiary, Oregon, Smith, 978.
Cocksfield, Eocene, Tertiary, Louisiana, Veatch, 1073.
Cocksfield beds, included in Eocene, Tertiary, Louisiana, Harris, 448.
Cocksfield Ferry beds, Eocene, Tertiary, Louisiana, Veatch, 1072.
Coldwater shales, Carboniferous, Michigan, Russell, 924.
Coleman division, Carboniferous, Texas, Hill, 499.
Columbia, Pleistocene, Quaternary, Virginia, North Carolina, Darton, 245.
Columbia formation, Tertiary, Louisiana, Clendenin, 198.
Columbia group, Quaternary, Maryland, Shattuck, 953, 955.
Columbia River lava, Tertiary, Oregon, Knowlton, 599.
Colville series, Tertiary, Alaska, Schrader, 942.
Comanche Peak beds, Cretaceous, Texas, Hill, 499.
Comanche Peak limestone, Cretaceous, Texas, Hill and Vaughan, 505.
Comanche series, Cretaceous, Texas, Hill, 499.
Comanche series, Cretaceous, Texas, Hill and Vaughan, 505.
Conasauga formation, Cambrian, Alabama, Hayes, 475.
Conemaugh formation, Carboniferous, Maryland. Included in Coal Measures. Includes Lower Mahoning sandstone, Mahoning limestone, Mahoning coal, Upper Mahoning sandstone, Masontown coal, Lower Cambridge limestone, Buffalo sandstone, Upper Cambridge limestone, Lower red shales, Bakerstown coal, Saltsburg sandstone, Crinoidal coal, Ames or Crinoidal limestone, Elklick coal, Morgantown sandstone, Clarksburg limestone, Franklin or Little Clarksburg coal, Connellsville sandstone, Lower Pittsburg limestone, and Lower Pittsburg coal, Clark and Martin, 178.
Conemaugh formation, Carboniferous, Maryland, Martin, 735.
Conemaugh formation, Carboniferous, Pennsylvania, Campbell, 158.
Conemaugh formation, Carboniferous, Pennsylvania, White and Campbell, 1119.
Cornwall limestones, Silurian, New York, Eckel, 322.
Corryville beds, Ordovician, Ohio and Indiana, Nickles, 805.
Corsicana beds, Cretaceous, Texas, Hill, 499.
Corwin series, Mesozoic, Alaska, Schrader, 942.
Cottonwood limestone, Carboniferous, Kansas, Beede, 76.
Couchiching rocks, Canada, Coleman, 205.
Council Grove stage, Carboniferous, Kansas, Prosser, 877.
Cow Creek beds, Cretaceous, Texas, Hill, 499.
Crow Ridge series, Mesozoic, Montana, Weed, 1095.
Cumberland sandstone, Ordovician, Kentucky, Foerste, 382.
Dakota, Cretaceous, Montana, Willis, 1134.
Dakota formation, Cretaceous, North Dakota, Babcock, 40.
Dakota sandstone, Cretaceous, South Dakota, Darton, 246.
Dakota sandstones, Jurassic, Colorado, Hatcher, 456.
Decker Ferry limestone, Silurian, New Jersey, Kümmel and Weller, 609.
Deer Creek limestone, Carboniferous, Kansas, Beede, 76.
Del Rio clay, Cretaceous, Texas, Hill and Vaughan, 505.
Del Rio formation, Cretaceous, Texas, Hill, 499.
Denison beds, Cretaceous, Texas, Hill, 499.
Denton subgroup, Cretaceous, Texas, Hill, 499.
Des Moines, Pennsylvanian series, Iowa, Leonard, 680.
Des Moines division, Carboniferous, Kansas, Missouri, Bain, 45.
Des Moines stage, Pennsylvanian series, Carboniferous, Iowa, Wilder, 1139.
Dexter sands, Cretaceous, Texas, Hill, 499.
Ditney formation, Carboniferous, Indiana, Fuller and Ashley, 397.
Doré conglomerate, Huronian, Canada, Coleman and Willmott, 207, 208.
Double Mountain formation, Carboniferous, Texas, Hill, 499.
Dover limestone, Carboniferous, Kansas, Beede, 76.
Doyle shales, Carboniferous, Kansas, Prosser, 877.
Duck Creek formation, Cretaceous, Texas, Hill, 499.
Dundee limestone, Devonian, Michigan, Russell, 924.
Dundee limestone, included in Traverse group, Devonian, Michigan, Grabau, 417.
Dunkard formation, Carboniferous, Pennsylvania, Campbell, 158.
Dunkard formation, Carboniferous, Maryland, Martin, 735.
Dunkard formation, Carboniferous, Pennsylvania, White and Campbell, 1119.

Geologic formations—Continued.
Dunkard formation, Permian?, Maryland. Includes Waynesburg sandstone, Waynesburg "A" coal, Washington coal, Upper Washington limestone, Jollytown coal, and Jollytown limestone, Clark and Martin, 178.
Eagle Ford formation, Cretaceous, Texas, Dumble, 309.
Eagle Ford formation, Cretaceous, Texas, Hill, 499.
Eagle Ford formation, Cretaceous, Texas, Hill and Vaughan, 505.
Edwards limestone, Cretaceous, Texas, Hill, 499.
Edwards limestone, Cretaceous, Texas, Hill and Vaughan, 505.
Eleanor slates, Huronian, Canada, Coleman and Willmott, 207, 208.
Elkhorn hornstone, Cambrian, Montana, Weed, 1095.
Elmdale formation, Carboniferous, Kansas, Beede, 76.
Elmdale formation, Carboniferous, Kansas, Prosser, 877.
Emporia limestone and shale, Carboniferous, Kansas, Prosser, 877.
Eskridge shales, Carboniferous, Kansas, Beede, 76.
Eskridge shales, Carboniferous, Kansas, Prosser, 877.
Escondido series, Tertiary, California, Hershey, 485.
Fairmount beds, Ordovician, Ohio and Indiana, Nickles, 805.
Fayetteville shale, Carboniferous, Arkansas, Adams, 7.
Fickett series, Carboniferous, Alaska, Schrader, 942.
Florence flint, Carboniferous, Kansas, Prosser, 877.
Floyd shale, Carboniferous, Alabama and Georgia, Hayes, 475.
Fordham gneiss, New York, Eckel, 322.
Fordham gneiss, Pre-Cambrian, New York, Merrill, 770.
Fort Payne chert, Carboniferous, Alabama and Georgia, Hayes, 475.
Fort Riley limestone, Carboniferous, Kansas, Prosser, 877.
Fort Worth formation, Cretaceous, Texas, Hill, 499.
Franciscan series, California, Lawson and Palache, 666.
Fredericksburg division, Cretaceous, Texas, Hill, 499.
Fredericksburg limestone, Cretaceous, Texas, Dumble, 309.
Fredericktown limestone, Cambrian, Missouri, Adams, 7.
Frog Mountain limestone, Devonian, Alabama, Hayes, 475.
Frio clays, Oligocene, Tertiary, Louisiana, Veatch, 1072.
Frio clays, Tertiary, Texas and Louisiana, Fishback, 370.
Fuson formation, Cretaceous, South Dakota, Darton, 246.
Geologic formations—Continued.
Garrison formation, Carboniferous, Kansas, Prosser, 877.
Gasconade limestone, Ordovician, Missouri, Adams, 7.
Georgetown formation, Cretaceous, Texas, Hill, 499.
Georgetown limestone, Cretaceous, Texas, Hill and Vaughan, 505.
Gerona marble, Cuba, Hayes, Vaughan, and Spencer, 473.
Glen Rose beds, Cretaceous, Texas, Hill, 499.
Glen Rose formation, Cretaceous, Texas, Hill and Vaughan, 505.
Goodland limestone, Cretaceous, Indian Territory, Taff, 1006.
Goodland limestone, Cretaceous, Texas, Hill, 499.
Graneros shale, Cretaceous, South Dakota, Darton, 246.
Granton diabase, Juratrias, New Jersey, Merrill, 770.
Grand Gulf, Oligocene, Tertiary, Louisiana, Veatch, 1072, 1073.
Grand Gulf formation, post-Tertiary, Gulf region, Smith and Aldrich, 970.
Grand Gulf formation, Tertiary, Dall, 238.
Grand Gulf group, Tertiary, Louisiana, Lerch, 682.
Grand Gulf stage, included in Oligocene, Tertiary, Louisiana, Harris, 448.
Gravina series, Mesozoic, Alaska, Brooks, 134.
Graydon sandstone, Carboniferous, Missouri, Adams, 7.
Grayson formation, Cretaceous, Texas, Hill, 499.
Greenbrier formation, Carboniferous, Maryland, Martin, 735.
Greenbrier limestone, Carboniferous, Pennsylvania, Campbell, 158.
Greenhorn limestone, Cretaceous, South Dakota, Darton, 246.
Green Pond conglomerate, Silurian, New Jersey, Kümmel and Weller, 609.
Green Pond conglomerate, Silurian, New York, Eckel, 322.
Grimes sandstones, included in Portage, Devonian, New York, Luther, 711.
Grinnell argillite, Algonkian, Montana, Willis, 1144.
Gros Cap greenstones, Huronian, Canada, Coleman and Willmott, 207, 208.
Guadalupian, Carboniferous, Texas, Girty, 408. Exact synonym Permian.
Gulf series, Cretaceous, Texas, Hill and Vaughan, 505.
Guyandot sandstone, Carboniferous, West Virginia, Campbell, 157.
Hampshire formation, Devonian, Maryland, Martin, 735.
Hannibal sandstone and shales, Carboniferous, Missouri, Adams, 7.
Hardyston quartzite, Cambrian, New Jersey, Kümmel and Weller, 609.
Harrison diorite, post-Hudson, New York, Merrill, 770.

Geologic formations—Continued.
Hartford (Topeka) limestone, Carboniferous, Kansas, Beede, 76.
Hartshorne sandstone, Carboniferous, Indian Territory, Taff, 1006, 1007.
Harvey conglomerate, Carboniferous, West Virginia, Campbell, 157.
Helen iron formation, Huronian, Canada, Coleman and Willmott, 208.
Hensell sands, Cretaceous, Texas, Hill, 499.
Hinton formation, Carboniferous, West Virginia, Campbell, 157.
Hobo-Gulch lime-shale, Cambrian, Montana, Weed, 1095.
Horsetail Creek beds, Tertiary, Colorado, Matthew, 751.
Horton series, Canada, Fletcher, 376.
Horton slates, Devonian or Carboniferous, Canada, Haycock, 471.
Howard limestone, Carboniferous, Kansas, Beede, 76.
Hudson formation, Ordovician, New York, Eckel, 322.
Hudson River group, Ordovician, New York, Clarke, 189.
Hudson River shale ?, Ordovician, New Jersey, Kümmel and Weller, 609.
Hudson schist, Silurian, New York, Merrill, 770.
Huntington series, Triassic ?, Oregon, Lindgren, 687.
Hunton limestone, Indian Territory, Taff, 1006.
Huronian, Willmott, 1160.
Idaho formation, Tertiary, Idaho, Russell, 923.
Idalia shale, Tertiary, Missouri, Marbut, 733.
Illinois drift, Quaternary, Salisbury, New Jersey, 930.
Illinoisan drift, Quaternary, Leverett, 685.
Iowan, Quaternary, New Jersey, Salisb ry, 930.
Iron Mountain porphyry, pre-Cambrian, Missouri, Adams, 7.
Ithaca group, Devonian, New York, Clarke, 189.
Izard limestone, Ordovician, Missouri, Adams, 7.
Jackford sandstone, Silurian, Indian Territory, Taff, 1006.
Jackson, Eocene, Tertiary, Louisiana, Veatch, 1072, 1073.
Jackson stage, included in Eocene, Tertiary, Louisiana, Harris, 448.
Jackson stage, Tertiary, Louisiana, Casey, 164.
Jennings formation, Devonian, Maryland, Martin, 723.
John Day series, Tertiary, Oregon, Knowlton, 598.
Judith River beds, Cretaceous, Hatcher, 463.
Judith River beds, Cretaceous, Stanton, 995.
Kanawha black flint, Carboniferous, West Virginia, White, 1123.
Kanawha formation, Carboniferous, West Virginia, Campbell, 157.
Geologic formations—Continued.
Kansan, Quaternary, New Jersey, Salisbury, 930.
Kansan or pre-Kansan drift, Quaternary, Leverett, 685.
Kanuti series, probably Paleozoic, Alaska, Mendenhall, 763.
Kanwaka shales, Carboniferous, Kansas, Beede, 76.
Keene limestone, Devonian, Montana, Weed, 1095.
Kemp clay, Cretaceous, Texas, Hill, 499.
Kenai series, probably Tertiary, Alaska, Mendenhall, 763.
Kenai series, Tertiary, Alaska, Schrader, 931.
Keokuk limestone, Mississippian series, Carboniferous, Iowa, Savage, 937.
Ketchikan series, Upper Paleozoic, Alaska, Brooks, 134.
Kiamichi formation, Cretaceous, Indian Territory, Taff, 1006.
Kiamitia clays, Cretaceous, Texas, Hill, 499.
Kigluaik series, Alaska, Brooks, 132.
Kigluaik series, older than Silurian, Alaska, Collier, 209.
Kinderhook formation, Carboniferous, Iowa, Sardeson, 935.
Kinderhook formation, Carboniferous, Mississippi Valley region, Keyes, 578.
King limestone, Carboniferous, Missouri, Adams, 7.
Kittatinny limestone, Cambrian, New Jersey, Kümmel and Weller, 609.
Kiutia argillite, Algonkian, Montana, Willis, 1144.
Knob Lick granite, pre-Cambrian, Missouri, Adams, 7.
Knox dolomite, Silurian, Alabama and Georgia, Hayes, 475.
Knoxville beds, Cretaceous, Oregon, Knowlton, 599.
Knoxville shales, Cretaceous, California, Lawson and Palache, 666.
Koyukuk series, Cretaceous, Alaska, Schrader, 942.
Kugruk group, Silurian or Devonian, Alaska, Collier, 209.
Kuzitrin series, Alaska, Brooks, 132.
Kuzitrin series, older than Silurian, Alaska, Collier, 209.
Lafayette, Louisiana, Veatch, 1072.
Lafayette formation, Neocene, Maryland, Shattuck, 956.
Lafayette (?) formation, Neocene (?), Tertiary, Georgia and Alabama, Hayes, 475.
Lafayette formation, Tertiary, Quaternary?, Louisiana, Clendenin, 198.
Lakota formation, Cretaceous, South Dakota, Darton, 246.
La Motte sandstone, Cambrian, Missouri, Adams, 7.
Lang division, Pliocene, Tertiary, California, Hershey, 485.
Laramie, Cretaceous, Montana, Willis, 1144.
Laramie, Cretaceous, Nebraska, Fisher, 372.

Geologic formations—Continued.
Laramie formation, Cretaceous, North Dakota, Babcock, 40.
Laramie formation, Cretaceous, North Dakota, Wilder, 1138.
Laramie formation, Cretaceous, Wyoming, Adams, 8.
Lecompton limestone, Carboniferous, Kansas, Beede, 76.
Leseuer limestone, Cambrian, Missouri, Adams, 7.
Lewisville beds, Cretaceous, Texas, Hill, 499.
Lignitic, Eocene, Tertiary, Louisiana, Veatch, 1072.
Lignitic formation, Eocene, Louisiana, Harris, 449.
Lignitic stage, included in Eocene, Tertiary, Louisiana, Harris, 448.
Lisburne formation, Devonian, Alaska, Schrader, 942.
Lista Blanca division, Triassic, Arizona, Dumble, 304.
Lockport limestone, Silurian, Indiana, Kindle, 581.
Logan group, Carboniferous, Ohio, Bownocker, 108.
Longwood red shales, Silurian, New York, Eckel, 322.
Longwood shale, Silurian, New Jersey, Kümmel and Weller, 609.
Lookout sandstone, Carboniferous, Georgia, Hayes, 475.
Lorraine formation, Ordovician, Canada, Ells, 333.
Lorraine formation, Ordovician, Kentucky, Foerste, 382.
Lorraine group, Ordovician, Ohio and Indiana, Nickles, 805.
Los Angelan epoch, Quaternary, California, Hershey, 489.
Louisiana limestone, Carboniferous, Missouri, Adams, 7.
Loup Fork formation, Tertiary, Colorado, Matthew, 751.
Lower Claiborne stage, included in Eocene, Tertiary, Louisiana, Harris, 448.
Lower Helderberg, Silurian, Ohio, Bownocker, 108.
Lower Magnesian group, Silurian, Illinois, Alden, 15.
Lytton formation, Eocene, Tertiary, Texas, Hill and Vaughan, 505.
McAlester shale, Carboniferous, Indian Territory, Taff, 1006, 1007.
Madison limestone, Carboniferous, Montana, Weed, 1095.
Main Street limestone, Cretaceous, Texas, Hill, 499.
Mal Pais gravel, Cuba, Hayes, Vaughan, and Spencer, 473.
Maltrata, Cretaceous, Mexico, Villarello and Böse, 1076.
Mansfield group, Carboniferous, Indiana, Ashley, 39.
Marble Falls limestone, Carboniferous, Texas, Hill, 499.
Geologic formations—Continued.
Marion formation, Carboniferous, Kansas, Prosser, 877.
Martin Canyon beds, Tertiary, Colorado, Matthew, 751.
Mascall formation, Tertiary, Oregon, Knowlton, 598.
Matawan formation, upper Cretaceous, Maryland, Shattuck, 955.
Matfield shales, Carboniferous, Kansas, Prosser, 877.
Mauch Chunk, Carboniferous, Pennsylvania, Stevenson, 1001.
Mauch Chunk formation, Carboniferous, Maryland, Martin, 735.
Mauch Chunk formation, Carboniferous, Pennsylvania, Fuller, 395.
Mauch Chunk shale, Carboniferous, Pennsylvania, Campbell, 158.
Medina shales, Silurian, Canada, Ells, 333.
Mellenia series, Tertiary, California, Hershey, 485.
Merced series, California, Arnold and Arnold, 36.
Mercer group, included in Pottsville, Carboniferous, Pennsylvania, White and Campbell, 1119.
Merom group, Carboniferous, Illinois, Ashley, 39.
Michigan series, Carboniferous, Michigan, Russell, 924.
Midway stage, included in Eocene, Tertiary, Louisiana, Harris, 448.
Milburn beds, Carboniferous, Texas, Hill, 499.
Millersburg formation, Carboniferous, Indiana, Fuller and Ashley, 397.
Millsap division, Carboniferous, Texas, Taff, 1007.
Millstone grit, Carboniferous, Missouri, Adams, 7.
Minnekahta limestone, Carboniferous, South Dakota, Darton, 246.
Minnelusa sandstone, Carboniferous, South Dakota, Darton, 246.
Minnewaste limestone, Cretaceous, South Dakota, Darton, 246.
Missourian division, Carboniferous, Kansas, Missouri, Bain, 45.
Monmouth formation, upper Cretaceous, Maryland, Shattuck, 955.
Monongahela formation, Carboniferous, Maryland. Included in Coal Measures. Includes Pittsburg coal, Redstone limestone, Redstone coal, Sewickley limestone, Lower Sewickley coal, Upper Sewickley or Tyson coal, Sewickley sandstone, Uniontown coal, Uniontown sandstone, Waynesburg limestone, and Waynesburg coal, Clark and Martin, 178.
Monongahela formation, Carboniferous, Maryland, Martin, 735.
Monongahela formation, Carboniferous, Pennsylvania, Campbell, 158.
Monongahela formation (includes Elk Garden coal, Tyson coal, Koontz coal) Carboniferous, Maryland, White, 1117.

Geologic formations—Continued.
Monongahela formation (includes Pittsburg coal, Redstone coal, Sewickley coal, Uniontown coal, Waynesburg coal) Carboniferous, Pennsylvania, White and Campbell, 1119.
Monroe formation, Silurian, Michigan, Russell, 924.
Monroe shales, Devonian, New Jersey, Kümmel and Weller, 607.
Monroe shales, Devonian, New York, Eckel, 322.
Monterey series, California, Lawson and Palache, 666.
Monument Creek formation, Colorado, Lee, 671.
Morrison shales, Cretaceous, Colorado, Lee, 672.
Mount Auburn beds, Ordovician, Ohio and Indiana, Nickles, 805.
Mount Hope beds, Ordovician, Ohio and Indiana, Nickles, 805.
Nanushak series, Cretaceous, Alaska, Schrader, 942.
Navarro beds, Cretaceous, Texas, Hill, 499.
Navesink marls, included in Monmouth formation, Cretaceous, Maryland, Shattuck, 955.
Necoxtla, Cretaceous, Mexico, Villarello and Böse, 1076.
Neva limestone, Carboniferous, Kansas, Beede, 76.
Neva limestone, Carboniferous, Kansas, Prosser, 877.
New Glasgow conglomerate, Permian, Carboniferous, Canada, Fletcher, 375.
Newark beds, Juratrias, New York, Eckel, 322.
Newark group, Juratrias, New Jersey, Merrill, 770.
Newark system, Atlantic coast region, Hobbs, 514.
Newfoundland grit, Devonian, New Jersey, Kümmel and Weller, 609.
Newfoundland quartzite, Devonian, New York, Eckel, 322.
Niagara group, Silurian, Illinois, Alden, 15.
Niobrara formation, Cretaceous, South Dakota, Darton, 246.
Niobrara formation, Cretaceous, North Dakota, Babcock, 40.
Niobrara formation, Jurassic, Colorado, Hatcher, 456.
Niobrara group, Cretaceous, Kansas, Lindgren, 691.
Nogales division, Tertiary, Arizona, Dumble, 304.
Nome series, Alaska, Brooks, 132.
Nome series, Paleozoic and Mesozoic, Alaska, Collier, 209.
Nulato sandstone, Alaska, Schrader, 931.
Nuttall sandstone, Carboniferous, West Virginia, Campbell, 157.
Ogallala formation, Tertiary, Wyoming, Nebraska, Adams, 8.
Olpe shales, Carboniferous, Kansas, Beede, 76.

Geologic formations—Continued.
Opeche formation, Carboniferous, South Dakota, Darton, 246.
Orindan formation, California, Lawson and Palache, 666.
Otterdale sandstones, Triassic, Virginia, Woodworth, 1179.
Oxmoor sandstone, Carboniferous, Georgia, Hayes, 475.
Ozarkian, Hershey, 483.
Palisade diabase, Juratrias, New Jersey, Merrill, 770.
Paluxy sands, Cretaceous, Texas, Hill, 499.
Pamunkey formation, Tertiary, Virginia, North Carolina, Darton, 245.
Patapsco, Cretaceous, Maryland, Clark and Bibbins, 176.
Patapsco formation, lower Cretaceous, Maryland, Shattuck, 955.
Patuxent formation, Cretaceous, Maryland, Clark and Bibbins, 176.
Patuxent formation, Jurassic?, Maryland, Shattuck, 955.
Pawnee Creek beds, Tertiary, Colorado, Matthew, 751.
Pawpaw formation, Cretaceous, Texas, Hill, 499.
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armatus n. sp., Anderson, 33.
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phœnixensis n. sp., Anderson, 33.
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Lobocrinus dubius n. sp., Rowley, 915.
(?) dubius var. pustulosus n. var., Rowley, 915.
(?) insolitus n. sp., Rowley, 915.
Lonsdaleia McCoy, Lambe, 638.
picroense Billings (sp.), Lambe, 638.
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(Gaudryceras) kayei Forbes, Anderson, 33.
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Metablastus bipyramidalis? Hall, Rowley, 430.
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gracilis, Osborn, 827.
scottianus Cope, Osborn, 827.
(Mesacodon) speciosus Marsh, Osborn, 827.
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postica n. sp., Sardeson, 932.
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Monoclonius belli n. sp., Lambe, 639.
canadensis n. sp., Lambe, 639.
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Murchisonia argylensis n. sp., Sardeson, 933.
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putilla n. sp., Sardeson, 933.
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Myalina? abstemia n. sp., Sardeson, 935.
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(Lingulella) collicia Matthew, Walcott, 1080.
(Lingulella) concinnus Matthew, Walcott, 1080.
(Westonia) finlandensis n. sp., Walcott, 1080.
(Lingulella) lens Matthew, Walcott, 1080.
(Bröggeria) salteri Holl, Walcott, 1080.
(Lingulella) schmalenseі n. sp., Walcott, 1080.
(Lingulella) spatulus n. sp., Walcott, 1080.
(Lingulella) welleri n. sp., Walcott, 1080.
Ogygopsis klotzi Rom. sp., Woodward, 1177.
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Ophileta alturensis n. sp., Sardeson, 933.
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Orbitremites grandis n. sp., Rowley, 429.
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Orchestes avus n. sp., Scudder, 948.
Oreodon robustum n. sp., Douglass, 291.
Ornithomimus altus n. sp., Lambe, 639.
Ornithostoma ingens Williston, Lucas, 703.
Orohippus? sp., Hatcher, 453.
Orthis (Billingsella) pepina Hall, Sardeson, 933.
Orthoceras minnesotense, n. sp., Sardeson, 932.
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devoniense Milne Edwards and Haime, Lambe, 638.
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haydeni Cope, Matthew, 755.
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Pelycodus Cope, Osborn, 827.
frugivorus Cope, Osborn, 827.
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PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Bulletin No. 221.]

The serial publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of United States—folios and separate sheets thereof, (8) Geologic Atlas of United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

The Bulletins, Professional Papers, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports. This bulletin is the twenty-fifth in Series G, the complete list of which follows (all are bulletins thus far):

BULLETINS, SERIES G, MISCELLANEOUS.

2. Gold and silver conversion tables, giving the coining values of troy ounces of fine metal, etc., computed by Albert Williams, jr. 1883. 8 pp.
7. Mapoteca geologica Americana: A catalogue of geological maps of America (North and South), 1752–1881, in geographic and chronologic order, by Jules Marcou and John Belknap Marcou. 1884. 184 pp.
25. The present technical condition of the steel industry of the United States, by Phineas Barnes. 1885. 85 pp.
26. Copper smelting, by Henry M. Howe. 1885. 107 pp.
44. Bibliography of North American geology for 1886, by Nelson H. Darton. 1887. 35 pp.
75. Record of North American geology for 1887–1889, inclusive, by Nelson Horatio Darton. 1891. 173 pp.
91. Record of North American geology for 1890, by Nelson Horatio Darton. 1891. 88 pp.
99. Record of North American geology for 1891, by Nelson Horatio Darton. 1892. 73 pp.
100. Bibliography and index of the publications of the U. S. Geological Survey, 1879–1892, by Philip Creveling Warman. 1893. 495 pp.
127. Catalogue and index of contributions to North American geology, 1732–1891, by Nelson Horatio Darton. 1896. 1,045 pp.
130. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for 1892 and 1893, by Fred Boughton Weeks. 1896. 210 pp.
131. Report of progress of the division of hydrography for the calendar years 1893 and 1894, by Frederick Haynes Newell. 1895. 126 pp.
135. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1894, by F. B. Weeks. 1896. 141 pp.
140. Report of progress of the division of hydrography for the calendar year 1895, by Frederick Haynes Newell. 1896. 356 pp.
146. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1895, by F. B. Weeks. 1896. 130 pp.
149. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1896, by Fred Boughton Weeks. 1897. 152 pp.
156. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1897, by Fred Boughton Weeks. 1898. 130 pp.
162. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1898, by Fred Boughton Weeks. 1899. 163 pp.
172. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1899, by Fred Boughton Weeks. 1900. 141 pp.
177. Catalogue and index of the publications of the United States Geological Survey, 1880–1901, by Philip Creveling Warman. 1901. 858 pp.
188. Bibliography of North American geology, paleontology, petrology, and mineralogy for the years 1892–1900, inclusive, by Fred Boughton Weeks. 1902. 717 pp.
189. Index to North American geology, paleontology, petrology, and mineralogy for the years 1892–1900, inclusive, by Fred Boughton Weeks. 1902. 337 pp.
203. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1901, by Fred Boughton Weeks. 1902. 144 pp.
215. Catalogue and index of the publications of the United States Geological Survey, 1901 to 1903, by Philip Creveling Warman. 1903. 234 pp.
221. Bibliography and index of North American geology, paleontology, petrology, and mineralogy for the year 1902, by Fred Boughton Weeks. 1903. 200 pp.

Correspondence should be addressed to

The DIRECTOR,
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Bulletin No. 222 Series G, Miscellaneous, 26

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

CATALOGUE AND INDEX

OF THE

PUBLICATIONS

OF THE

HAYDEN, KING, POWELL, AND WHEELER SURVEYS

NAMELY

GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES
GEOLOGICAL EXPLORATION OF THE FORTIETH PARALLEL
GEOGRAPHICAL AND GEOLOGICAL SURVEYS OF THE ROCKY MOUNTAIN REGION
GEOGRAPHICAL SURVEYS WEST OF THE ONE HUNDREDTH MERIDIAN

BY

L. F. SCHMECKEBIER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1904

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., November 11, 1903.

SIR: I transmit herewith the manuscript for a "Catalogue and Index of the Publications of the Hayden, King, Powell, and Wheeler Surveys," prepared by Mr. L. F. Schmeckebier, of the editorial division of the Geological Survey, and recommend that it be published in the Bulletin series of the Survey.

The publications of these early Government organizations constitute a storehouse of geographic, geologic, ethnologic, and archæologic information concerning the western portion of the United States; and though their usefulness may have diminished as a result of more detailed surveys and more precise work, I believe that this complete catalogue and consolidated index will be welcomed by many students, investigators, and librarians.

Very respectfully,

P. C. WARMAN,
Editor.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

INTRODUCTION.

The field work of the four great surveys whose publications are catalogued and indexed herein was done between 1867 and 1879, when the United States Geological Survey was organized. The office work, such as the preparation of maps and reports, continued until several years later.

As far as known to the writer, no complete list of the publications of these surveys has been issued. The last edition of the catalogue of the Hayden survey was published in 1879, and the last edition of the catalogue of the Wheeler survey was issued in 1881. These catalogues are necessarily incomplete, as all the publications of these surveys had not been issued at the time the catalogues were printed.

The index is general in character, giving a bird's-eye view of the publications, and is not a compilation of details such as would be found in the indexes to the individual reports. For instance, it has been found impracticable to index generic and specific names in botany and zoology. The few specific or generic names appearing in the index are portions of the titles of papers. However, in order to give a general view of publications on zoology and botany, all entries referring to these subjects are subordinated under the headings: "Vertebrates;" "Vertebrates, fossil;" "Invertebrates;" "Invertebrates, fossil;" "Plants;" and "Plants, fossil." Likewise, all entries relating to ethnologic and archæologic subjects are included in the group "Ethnology and Archæology." All geographic entries are classified under names of States and Territories.

The United States Geological Survey has no copies of these publications for distribution.

For many suggestions at various stages of the work the writer is indebted to Mr. P. C. Warman.

L. F. S.

CATALOGUE AND INDEX OF THE PUBLICATIONS OF THE HAYDEN, KING, POWELL, AND WHEELER SURVEYS.

By L. F. SCHMECKEBIER.

CATALOGUE.

UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES (HAYDEN).

ANNUAL REPORTS.

1867.

[First Annual Report of the United States Geological Survey of the Territories, embracing Nebraska, by F. V. Hayden, U. S. geologist. Conducted under the authority of the Commissioner of the General Land Office. 1867.] Pages 124–177 of the Report of the Commissioner of the General Land Office for the year 1867. Washington: Government Printing Office. 1867.

[NOTE.—Reprinted in 1873 in "First, Second, and Third Annual Reports of the United States Geological Survey of the Territories." See page 10.]

1868.

[Second Annual Report of the United States Geological Survey of the Territories, embracing Wyoming, by F. V. Hayden, U. S. geologist. Conducted under the authority of the Commissioner of the General Land Office. 1868.] Pages 220–255 of the Report of the Commissioner of the General Land Office for the year 1868. Washington: Government Printing Office. 1868.

[NOTE.—Reprinted in 1873 in "First, Second, and Third Annual Reports of the United States Geological Survey of the Territories." See page 10.]

Report of F. V. Hayden on the geography of the Missouri Valley, pp. 220–229.
Geological explorations in Wyoming Territory [by F. V. Hayden], pp. 229–255.

1869.

[Third Annual] Preliminary Field Report of the United States Geological Survey of Colorado and New Mexico, conducted under the

authority of Hon. J. D. Cox, Secretary of the Interior, by F. V. Hayden, United States geologist. Washington: Government Printing Office. 1869.

8°. 155 pp.

Letter to the Secretary, pp. 3–5.

Geological report, by F. V. Hayden, pp. 7–99.

Mines and minerals of Colorado [and New Mexico], by Persifor Frazer, jr., pp. 101–130.

Agriculture of Colorado, by Cyrus Thomas, pp. 131–155.

[NOTE.—Reprinted in 1873 in First, Second, and Third Annual Reports of the Geological Survey of the Territories (see next entry).]

First, Second, and Third Annual Reports of the United States Geological Survey of the Territories for the years 1867, 1868, and 1869, under the Department of the Interior. Washington: Government Printing Office. 1873.

8°. 261 pp., 1 l.

Prefatory note, by F. V. Hayden, p. 3.

First Annual Report of the United States Geological Survey of the Territories, embracing Nebraska, by F. V. Hayden, U. S. geologist. Conducted under the authority of the Commissioner of the General Land Office. 1867. pp. 5–64.

[NOTE.—Reprinted from the "Report of the Commissioner of the General Land Office for the year 1867," pp. 124–177.]

Second Annual Report of the United States Geological Survey of the Territories, embracing Wyoming, by F. V. Hayden, U. S. geologist. Conducted under the authority of the Commissioner of the General Land Office. 1868. pp. 65–102.

[NOTE.—Reprinted from the "Report of the Commissioner of the General Land Office for the year 1868," pp. 220–255.]

Report of F. V. Hayden on the geography of the Missouri Valley, pp. 67–76.

Geological explorations in Wyoming Territory [by F. V. Hayden], pp. 76–102.

Third Annual Report of the United States Geological Survey of the Territories, embracing Colorado and New Mexico. Conducted under the authority of the Secretary of the Interior, by F. V. Hayden, U. S. geologist. pp. 103–251.

[NOTE.—Reprint of "Preliminary Field Report of the United States Geological Survey of Colorado and New Mexico."]

Letter to the Secretary, pp. 105–107.

Geological report, by F. V. Hayden, pp. 109–199.

Mines and minerals of Colorado [and New Mexico], by Persifor Frazer, jr., pp. 201–228.

Agriculture of Colorado, by Cyrus Thomas, pp. 229–251.

Index, pp. 253–261.

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1870.

[Fourth Annual] Preliminary Report of the United States Geological Survey of Wyoming and portions of contiguous Territories (being a *second annual* report of progress), conducted under the authority of

the Secretary of the Interior, by F. V. Hayden, United States geologist. Washington: Government Printing Office. 1871.

[NOTE.—Though called in the title a Second Annual Report, this is really the Fourth Annual Report, as the informal reports for 1867 and 1868 were considered the first and second of the series. There is another edition of this report, exactly identical, but with the date 1872.]

8°. 511 pp.

Letter to the Secretary, pp. 3–8.

Part I. Report of F. V. Hayden, pp. 9–81.

Part II. Geology of the Missouri Valley [by F. V. Hayden], pp. 83–188.

Part III. Report of Professor Cyrus Thomas, pp. 189–284.

Agriculture [in Wyoming and adjacent territory], pp. 189–264.

List and description of new species of Orthoptera, by Prof. Cyrus Thomas, pp. 265–284.

Part IV. Special reports, pp. 285–458.

I. Preliminary paleontological report, consisting of lists of fossils, with descriptions of some new types, etc., by F. B. Meek, pp. 287–318.

II. On the Tertiary coals of the West, by Jas. T. Hodge, geologist, pp. 318–329.

III. The ancient lakes of western America: Their deposits and drainage, by J. S. Newberry, LL. D., pp. 329–339.

IV. Report on the vertebrate fossils of the Tertiary formations of the West, by Prof. Joseph Leidy, pp. 340–370.

V. On the fossil plants of the Cretaceous and Tertiary formations of Kansas and Nebraska, by L. Lesquereux, pp. 370–385.

VI. On the fossil reptiles and fishes of the Cretaceous rocks of Kansas, by Prof. E. D. Cope, pp. 385–424.

VII. On the fishes of the Tertiary shales of Green River, Wyoming Territory, by Professor Edward D. Cope, pp. 425–432.

VIII. Recent reptiles and fishes. Report on the reptiles and fishes obtained by the naturalists of the expedition, by E. D. Cope, A. M., pp. 432–442.

IX. Material resources. Report on the industrial resources of western Kansas and eastern Colorado, by R. S. Elliott, pp. 442–458.

Part V. Catalogues, pp. 459–487.

I. Mammals and birds. A list of mammals and birds collected in Wyoming Territory, by Mr. H. D. Smith and Mr. James Stevenson, during the expedition of 1870, by James Stevenson, pp. 461–467.

II. Report on Mollusca, by S. R. Roberts, recorder conchological section, Academy Natural Sciences, Philadelphia, pp. 467–469.

III. Coleoptera. A list of Coleoptera collected by C. Thomas, in eastern Colorado and northeastern New Mexico, during the survey of 1869, by Dr. G. H. Horn, pp. 469–470.

IV. Hemiptera. A list of Hemiptera collected in eastern Colorado and northeastern New Mexico, by C. Thomas, during the expedition of 1869, by P. R. Uhler, Esq., pp. 471–472.

V. Catalogue of plants, by Thomas C. Porter, Lafayette College, Easton, Pennsylvania, pp. 472–483.

VI. Catalogue of plants. A list of plants collected by C. Thomas, in eastern Colorado and northeastern New Mexico, during the survey of 1869, by Dr. C. C. Parry, pp. 484–487.

Appendix. Meteorology, etc., by Mr. J. W. Beaman, pp. 488–501.

Index, pp. 503–511.

1871.

[Fifth Annual] Preliminary Report of the United States Geological Survey of Montana and portions of adjacent Territories; being a fifth annual report of progress. By F. V. Hayden, United States geologist. Conducted under authority of the Secretary of the Interior. Washington: Government Printing Office. 1872.

[NOTE.—This volume was also issued in quarto, only 30 copies being printed. The only annual issued in quarto.]

8°. vi, 3–538 pp., 2 l., 5 maps, 2 pls.

Letter to the Secretary, pp. 3–9.

Part I. Report of F. V. Hayden, pp. 11–204, 5 maps.

Part II. Agricultural resources of the Territories, by Professor Cyrus Thomas, pp. 205–279.

[Irrigation methods in Santa Clara Valley, California.] Letter of Professor G. N. Allen, pp. 269–271.

Short descriptions of some of the valleys of Nevada, by Mr. Haskell, of Reno, Nevada, pp. 271–273.

Experiments in cultivation on the plains along the line of the Kansas Pacific Railway, by R. S. Elliott, pp. 274–279.

Part III. Paleontology, pp. 281–377.

Fossil flora, by Leo Lesquereux, pp. 283.

I. Enumeration and description of the fossil plants from the specimens obtained in the explorations of Dr. F. V. Hayden, 1870 and 1871, pp. 283–303.

II. Remarks on the Cretaceous species described above, pp. 303–304.

III. Tertiary flora of North America, pp. 304–318.

On the geology and paleontology of the Cretaceous strata of Kansas, by Edward D. Cope, A. M., pp. 318–349.

On the vertebrate fossils of the Wahsatch strata, by Edward D. Cope, A. M., pp. 350–353.

On the fossil vertebrates of the early Tertiary formation of Wyoming, by Prof. Joseph Leidy, pp. 353–372.

Preliminary list of the fossils collected by Dr. Hayden's exploring expedition of 1871, in Utah and Wyoming Territories, with descriptions of a few new species, by F. B. Meek, pp. 373–377.

Part IV. Zoology and botany, pp. 379–498.

Notice of some worms collected during Professor Hayden's expedition to the Yellowstone River in the summer of 1871, by Prof. Joseph Leidy, of Philadelphia, pp. 381–382.

Coleoptera, by George H. Horn, M. D., Philadelphia, pp. 382–392.

Notices of the Hemiptera of the western Territories of the United States, chiefly from the surveys of Dr. F. V. Hayden, by P. R. Uhler, pp. 392–423.

Notes on the saltatorial Orthoptera of the Rocky Mountain regions, by Professor Cyrus Thomas, pp. 423–466, pls. i–ii.

List of species of butterflies collected by Campbell Carrington and William B. Logan, of the expedition, in 1871, by W. H. Edwards, pp. 466–467.

Report on the Recent reptiles and fishes of the survey, collected by Campbell Carrington and C. M. Dawes, by Edward D. Cope, A. M., pp. 467–476.

Catalogue of plants, by Prof. Thomas C. Porter, pp. 477–498.

Part V. Meteorology, by J. W. Beaman, pp. 499–524.

Index, pp. 525–538.

Supplement to the Fifth Annual Report of the United States Geological Survey of the Territories for 1871. F. V. Hayden, United States geologist in charge. Report on fossil flora. By Leo Lesquereux. Conducted under authority of the Secretary of the Interior. Washington: Government Printing Office. 1872.

8°. 22 pp.

An enumeration with descriptions of some Tertiary fossil plants, from specimens procured in the explorations of Dr. F. V. Hayden, in 1870, by Leo Lesquereux, pp. 5–22.

1872.

Sixth Annual Report of the United States Geological Survey of the Territories, embracing portions of Montana, Idaho, Wyoming, and Utah, being a report of progress of the explorations for the year 1872. By F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1873.

8°. xi, 844 pp., 12 pls., 5 maps, 4 leaves containing figs. 10, 14, 15, 34.

Letter to the Secretary, 1–10 pp.

Part I. 11–313 pp., 5 maps, 4 leaves containing figs. 10, 14, 15. 34.

Report of F. V. Hayden [on explorations in Yellowstone Valley and adjacent region], pp. 11–85, 3 maps, 3 leaves containing figs. 10, 14, 15.

Report of N. P. Langford on the resources of Snake River Valley, pp. 86–91.

Means of access to the Yellowstone National Park by railroad, by R. Hering, pp. 92–95.

Report of A. C. Peale, M. D., [on explorations in Colorado, Utah, and Wyoming], pp. 97–187, 1 leaf containing fig. 34.

Report of Frank H. Bradley, geologist of the Snake River division, pp. 189–271, 2 maps.

Physical geography and agricultural resources of Minnesota, Dakota, and Nebraska, by Cyrus Thomas, Ph. D., pp. 273–313.

Part II. Special reports on geology and paleontology, pp. 315–658, pls. 1–12.

Lignitic formation and fossil flora, by Leo Lesquereux, pp. 317–427.

Preliminary paleontological report, consisting of lists and descriptions of fossils, with remarks on the ages of the rocks in which they were found, etc., by F. B. Meek, paleontologist, pp. 429–518.

Report of a geological reconnaissance along the Union Pacific Railroad, by H. M. Bannister, M. D., pp. 519–541.

On the extinct vertebrata of the Eocene of Wyoming, observed by the expedition of 1872, with notes on the geology, by Edward D. Cope, A. M., pp. 543–649, pls. 1–6.

On remains of primitive art in the Bridger Basin of southern Wyoming, by Professor Joseph Leidy, pp. 651–654, pls. 7–12.

Ancient mounds of Dakota, by C. Thomas, Ph. D., pp. 655–658.

Part III. Special reports on zoology and botany, pp. 659–792.

Report on the mammals and birds of the expedition, by C. H. Merriam, pp. 661–715.

Coleoptera, by George H. Horn, M. D., Philadelphia, p. 717.

Notes on Orthoptera, by Cyrus Thomas, Ph. D., pp. 719–725.

Odonata from the Yellowstone, by Dr. H. Hagen, pp. 727–729.

Descriptions of new species of Mallophaga collected by C. H. Merriam while in the Government geological survey of the Rocky Mountains, Professor F. V. Hayden, United States geologist, by A. S. Packard, jr., M. D., pp. 731–734.

Description of new parasitic worms found in the brain and other parts of birds, by A. S. Packard, jr., M. D., pp. 735–737.

Description of new insects, by A. S. Packard, jr., M. D., pp. 739–741.

Insects inhabiting Great Salt Lake and other saline or alkaline lakes in the West, by A. S. Packard, jr., M. D., pp. 744–746.

Botany, by John M. Coulter, pp. 747–792.

Part IV. Report on astronomy and hypsometry, pp. 793–817.

Report on astronomy and hypsometry, by Henry Gannett, M. E., pp. 795–807.

Notes on the climate of Montana, by Mr. Granville Stuart, of Deer Lodge, Montana Territory, pp. 809–817.

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1873.

[Seventh] Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado, being a report of progress of the exploration for the year 1873, by F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1874.

8°. xii, 718 pp., 54 pls. and maps, 44 leaves containing figures and other illustrations.

Letter to the Secretary, pp. 1–14.

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1874.

[Eighth] Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado and parts of adjacent Territories; being a report of progress of the exploration for the year 1874. By F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1876.

8°. ix, 515 pp. 82 leaves containing illustrations, 8 leaves containing plate descriptions.

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1875.

Ninth Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado and parts of adjacent Territories; being a report of progress of the exploration for the year 1875. By F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1877.

8°. vii, 827 pp., 10 ll. unpaged, 75 pls. and maps.

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1876.

Tenth Annual Report of the United States Geological and Geograpical Survey of the Territories, embracing Colorado and parts of adjacent Territories, being a report of progress of the exploration for the year 1876. By F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1878.

8°. xxix, 546 pp., 79 pls., 3 maps.
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Report of William H. Jackson on the ancient ruins examined in 1875 and 1877, pp. 409–450, pls. xlvii–lxxiv.

Report of W. J. Hoffman, M. D., on the Chaco cranium, pp. 451–457, pls. lxxv–lxxvi.

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[Geologic, economic, and drainage maps of Colorado west of one hundred and second meridian, at end.]

1877.

Eleventh Annual Report of United States Geological and Geographical Survey of the Territories embracing Idaho and Wyoming, being a report of progress of the exploration for the year 1877. By F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1879.

8°. xxviii, 720 pp., 10 ll., 89 pls. and maps.

Letter to the Secretary, pp. ix–xxviii.

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1878.

Twelfth Annual Report of the United States Geological and Geographical Survey of the Territories: A report of progress of the exploration in Wyoming and Idaho for the year 1878. In two parts. Part I [Part II]. By F. V. Hayden, United States geologist. Conducted under the authority of the Secretary of the Interior. Washington: Government Printing Office. 1883.

8°. 2 pts. and case for maps. xviii, 809 pp., 32 ll., 155 pls. and maps; xxv, 503 pp. 2 ll., 151 pls., figs., and maps; map case containing 10 maps.

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Contributions to invertebrate paleontology, No. 2: Cretaceous fossils of the western States and Territories, by C. A. White, M. D., pp. 3–39, pls. 11–18.

Contributions to invertebrate paleontology, No. 3: Certain Tertiary Mollusca from Colorado, Utah, and Wyoming, by C. A. White, M. D., pp. 41–48, pl. 19.

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The Tertiary Lake basin at Florissant, Colo., between South and Hayden parks, by Samuel H. Scudder, pp. 271–293, map.

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A monograph of the phyllopod Crustacea of North America, with remarks on the order Phyllocarida, by A. S. Packard, jr., pp. 295–592, pls. i–xxxix, 1 map.

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D.—Contribution to a knowledge of the influence of external conditions of life upon the organization of animals, by Wladimir Schmankewitsch, pp. 473–514.

Osteology of Speotyto cunicularia hypogæa, by R. W. Shufeldt, M. D., captain, Medical Department, United States Army, pp. 593–626, pls. i–iii.

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Osteology of the North American Tetraonidæ, by R. W. Shufeldt, M. D., captain, Medical Department, United States Army, pp. 653–718, pls. v–xiii.

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Part II. Yellowstone National Park. xxv, 503 pp., 2 ll., 151 pls. and other illustrations.

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FINAL REPORTS OR MONOGRAPHS.

Department of the Interior. Report of the United States Geological Survey of the Territories. F. V. Hayden, United States geologist-in-charge. In five volumes[a] [Volume II–III, V–XIII] Washington: Government Printing Office. 1873 [–1890]

4°. 12 vols.

I. Fossil vertebrates. Part I.[b] Contributions to the extinct vertebrate fauna of the western Territories, by Prof. Joseph Leidy. 1873. 358 pp., 37 ll., 37 pls.

II. The vertebrata of the Cretaceous formations of the West, by E. D. Cope. 1875. 302 pp., 58 ll., 57 pls.

III. The vertebrata of the Tertiary formations of the West. Book I.[b] By Edward D. Cope, member of the National Academy of Sciences. 1883. xxxiv, 1009 pp., 136 ll., 134 pls.

[a] When the series was commenced it was intended to complete it in five volumes.

[b] *No other part.*

IV. Not published.

V. Zoology and Botany. Part I.[a] Synopsis of the Acrididæ of North America, by Cyrus Thomas, Ph. D. 1873. x, 262 pp., 1 pl.

VI. Contributions to the fossil flora of the Western Territories. Part I. The Cretaceous flora, by Leo Lesquereux. 1874. 136 pp., 34 ll., 30 pls.

VII. Contributions to the fossil flora of the Western Territories. Part II. The Tertiary flora, by Leo Lesquereux. 1878. xv, 366 pp., 66 ll., 65 pls.

VIII. Contributions to the fossil flora of the Western Territories. Part III. The Cretaceous and Tertiary floras, by Leo Lesquereux. 1883. xii, 283 pp., 60 ll., 60 pls.

IX. A report on the invertebrate Cretaceous and Tertiary fossils of the upper Missouri country, by F. B. Meek. 1876. lxiv, 629 pp., 45 ll., 45 pls.

X. A monograph of the geometrid moths or Phalænidæ of the United States, by A. S. Packard, jr., M. D., 1876. iv, 607 pp., 15 ll., 13 pls.

XI. Monographs of North American Rodentia, by Elliott Coues, captain and assistant surgeon, United States Army, secretary and naturalist of the survey; and Joel Asaph Allen, assistant in the Museum of Comparative Zoology, Cambridge, special collaborator of the survey. 1877. xii*, x, 1,091 pp., 1 l. (265 bis), 7 pls.

XII. Fresh-water rhizopods of North America, by Joseph Leidy, M. D., professor of anatomy in the University of Pennsylvania and of natural history in Swarthmore College, Pennsylvania. 1879. xi, 324 pp., 48 ll., 48 pls.

XIII. The Tertiary insects of North America, by Samuel H. Scudder. 1890. 734 pp., 28 pls.

BULLETINS.

Department of the Interior. Bulletin of the United States Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. 1874 and 1875. Volume I. Washington: Government Printing Office. 1875.

8°. xiii, 28, 77, 499 pp., 26 ll., 25 pls., 2 maps.

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[First series], No. 2. April 9, 1874. 77 pp., 2 ll.

Review of the vertebrata of the Cretaceous period found west of the Mississippi River, by Edward D. Cope, A. M., pp. 3–48.

Supplementary notices of fishes from the freshwater Tertiaries of the Rocky Mountains [by E. D. Cope], pp. 49–51.

On the general character and relation of the flora of the Dakota group, by Leo Lesquereux, pp. 52–62.

Descriptions of some new Orthoptera, and notes on some species but little known, by Cyrus Thomas, pp. 63–71.

Notes on the Rocky Mountain ranges in Colorado Territory, [by James T. Gardner], pp. 72–77.

[a] No other part.

Second series, No. 1. 1875. 47 pp., 1 l., 3 pls.

On the fishes of the Tertiary shales of the South Park [Colorado], by E. D. Cope, pp. 3–5.

On the cranial and dental characters of Mephitinæ, with description of Mephitis frontata, n. sp. foss., by Dr. Elliott Coues, U. S. A., pp. 7–15.

Ancient ruins in southwestern Colorado, by W. H. Jackson, pp. 17–38, pls. i–iii.

Note on some fossils from near the eastern base of the Rocky Mountains, west of Greeley and Evans, Colorado, and others from about two hundred miles farther eastward, with descriptions of a few new species, by F. B. Meek, palæontologist, pp. 39–47.

No. 2, second series. May 14, 1875. 49–142 pp., 1 l.

A monograph on the genus Leucosticte, Swainson; or gray-crowned purple finches, by Robert Ridgway, pp. 51–82.

The cranial and dental characters of Geomyidæ, by Dr. Elliott Coues, U. S. Army, pp. 83–90.

Synopsis of insectivorous mammals, by Theodore Gill, pp. 91–120.

Report on the natural history of the United States Geological and Geographical Survey of the Territories, 1874, by Ernest Ingersoll, zoölogist, pp. 121–124.

Special report on the Mollusca, by Ernest Ingersool, zoölogist, pp. 125–142.

No. 3, second series. May 15, 1875. 143–211 pp., 2 ll., 2 maps, vii–viii pls., 2 other illustrations.

Means of communication between Denver and the San Juan mines, by A. D. Wilson, topographer directing, pp. 145–149, 1 map.

Report on the mines and geology of the San Juan country, by F. M. Endlich, S. N. D., pp. 151–164, 1 map.

Report on the topography of the San Juan country, by Franklin Rhoda, assistant topographer, pp. 165–209, 2 illustrations.

Note on some peculiar forms of erosion in eastern Colorado, with heliotype illustrations, by F. V. Hayden, pp. 210–211, pls. vii–viii.

No. 4, second series. June 10, 1875. 215–231 pp., 10 ll., ix–xviii pls.

Notes on the surface features of the Colorado or Front Range of the Rocky Mountains, by F. V. Hayden, pp. 215–220, pls. ix–x.

The Tertiary Physopoda of Colorado, by Samuel H. Scudder, pp. 221–223.

Outlines of a natural arrangement of the Falconidæ, by Robert Ridgway, pp. 225–231, pls. xi–xviii.

No. 5, second series. January 8, 1876. 233–414 pp., 3 ll., 19–21 pls.

A review of the fossil flora of North America, by Leo Lesquereux, pp. 233–248.

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Notes on the Lignitic group of eastern Colorado and portions of Wyoming, by F. V. Hayden, pp. 401–411.

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No. 6, second series. February 8, 1876. 415–499 pp., 6 ll., 22–26 pls.

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Department of the Interior. Bulletin of the United States Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. 1876. Volume II. Washington: Government Printing Office. 1876.

8°. xii, 392 pp., 13 ll., 55 pls., 2 maps.

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Brief synopsis of North American earwigs, with an appendix on the fossil species, by Samuel H. Scudder, pp. 249–260.

List of the Orthoptera collected by Dr. A. S. Packard, in Colorado and the neighboring Territories, during the summer of 1875, by Samuel H. Scudder, pp. 261–267.

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Department of the Interior. Bulletin of the United States Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. 1877. Volume III. Washington: Government Printing Office. 1877.

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Department of the Interior. Bulletin of the United States Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. 1878. Volume IV. Washington: Government Printing Office. 1878.

8°. vii, 908 pp., 8 ll., 1 pl.

No. 1. February 5, 1878. 1–311 pp., 2 ll.

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Art. XXXIII. Report on the collection of fishes made by Dr. Elliott Coues, U. S. A., in Dakota and Montana during the seasons of 1873 and 1874, by David S. Jordan, M. D., pp. 777–799.

Art. XXXIV. Catalogue of phænogamous and vascular cryptogamous plants collected during the summers of 1873 and 1874 in Dakota and Montana along the forty-ninth parallel, by Dr. Elliott Coues, U. S. A.: with which are incorporated those collected in the same region at the same times by Mr. George M. Dawson, by Prof. J. W. Chickering, pp. 801–830.

Art. XXXV. On some striking products of erosion in Colorado, by F. M. Endlich, S. N. D., pp. 831–864.

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Art. XXXVII. Synonymatic list of American Sciuri, or arboreal squirrels, by J. A. Allen, pp. 877–887.

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Department of the Interior. Bulletin of the United States Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. 1879–80. Volume V. Washington: Government Printing Office. 1880.

8°. vii, 1072 pp., 8 ll., 4 pls.

No. 1. February 28, 1879. 1–152 pp., 4 ll., i–ii pls.

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Art. XVIII. On the species of the genus Bassaris, by J. A. Allen, pp. 331–340.

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No. 4. September 30, 1880. 521–1072 pp., 1 l.

Art. XXVI. Third installment of American ornithological bibliography, by Dr. Elliott Coues, U. S. A., pp. 521–1066.

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Department of the Interior. Bulletin of the United States Geological and Geographical Survey of the Territories. F. V. Hayden,

U. S. geologist-in-charge. 1882. Volume VI. Washington: Government Printing Office. 1882.

8°. vi, 598 pp., 10 ll., 14 pls., 2 maps, 3 illustrations.

No. 1. February 11, 1881. 1–202 pp., 6 ll., i–iv pls.

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No. 2. September 19, 1881. 203–397 pp., 2 ll., v–xiv pls., 2 maps, 3 illustrations.

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Art. XVII. On a crayfish from the lower Tertiary beds of western Wyoming, by A. S. Packard, jr., pp. 391–397, 1 illustration.

No. 3. August 30, 1882. 399–598 pp., 2 ll.

Art. XVIII. Preliminary list of works and papers relating to the mammalian orders Cete and Sirenia, by Joel Asaph Allen, pp. 399–562.

Art. XIX. New moths, with partial catalogue of Noctuæ, by A. R. Grote, A. M., pp. 563–578.

Art. XX. New moths, principally collected by Mr. Roland Thaxter in Maine, with notes on noxious species and remarks on classification, pp. 579–591.

Index. 593–598 pp.

MISCELLANEOUS PUBLICATIONS.

Department of the Interior. United States Geological Survey of the Territories. F. V. Hayden, U. S. Geologist in charge. Miscellaneous publications. No. 1[–12]. Washington: Government Printing Office. 1873[–1880].

8°. 15 vols.

1. Lists of elevations in that portion of the United States west of the Mississippi River. [Second edition.[a]] Collated and arranged by Henry Gannett, Assistant. 1873. 47 pp.
1. List of elevations principally in that portion of the United States west of the Mississippi River. Third edition. Collated and arranged by Henry Gannett. 1875. 72, ii pp.
1. List of elevations principally in that portion of the United States west of the Mississippi River. Fourth edition. Collated and arranged by Henry Gannett, M. E. 1877. x, 167 pp., 1 map.
2. Meteorological observations during the year 1872 in Utah, Idaho, and Montana, prepared for publication by Henry Gannett, Assistant. 1873. 120 pp.
3. Birds of the Northwest: A hand-book of the ornithology of the region drained by the Missouri River and its tributaries. By Elliott Coues, captain and assistant surgeon, U. S. Army. 1874. xi, 791 pp.
4. Synopsis of the flora of Colorado, by Thomas C. Porter and John M. Coulter. March 20, 1874. 5 ll., 180 pp.
5. Descriptive catalogue of the photographs of the United States Geological Survey of the Territories for the years 1869 to 1873, inclusive. W. H. Jackson, photographer. 1874. 83 pp.
5. Descriptive catalogue of the photographs of the United States Geological Survey of the Territories for the years 1869 to 1875, inclusive. Second edition. W. H. Jackson, photographer. 1875. 81 pp., 14 illustrations.
6. Meteorological observations made during the year 1873 and the early part of the year 1874 in Colorado and Montana Territories. Prepared for publication by George B. Chittenden. 1874. 57 pp.
7. Ethnography and philology of the Hidatsa Indians, by Washington Matthews, assistant surgeon United States Army. 1877. vi, 239 pp.
8. Fur-bearing animals: A monograph of North American Mustelidæ, in which an account of the wolverine, the martens or sables, the ermine, the mink and various other kinds of weasels, several species of skunks, the badger, the land and sea otters, and numerous exotic allies of these animals, is contributed to the history of North American mammals. By Elliott Coues, captain and assistant surgeon, United States Army, secretary and naturalist of the Survey. Illustrated with sixty figures on twenty plates. 1877. xiv, 348 pp., 20 pls.
9. Descriptive catalogue of photographs of North American Indians, by W. H. Jackson, photographer of the Survey. 1877. vi, 124 pp.
10. Bibliography of North American invertebrate paleontology, being a report upon the publications that have hitherto been made upon the invertebrate paleontology of North America, including the West Indies and Greenland. By C. A. White, M. D., paleontologist of the United States Geological Survey, and H. Alleyne Nicholson, M. D., D. Sc., professor at the University of Saint Andrews, Scotland. 1878. 132 pp.

[a] The first edition of this publication was by Cyrus Thomas, and is catalogued under unclassified publications, p. 32.

11. Birds of the Colorado Valley: A repository of scientific and popular information concerning North American ornithology, by Elliott Coues. *Ηλθ ηλδε χελιδὼν χαλὰς ὥρας ἄγουσα.* Part first, Passeres to Laniidæ. Bibliographical Appendix, seventy illustrations. 1878. xvi, 807 pp.
12. History of North American pinnipeds: A monograph of the walruses, sealions, sea-bears, and seals of North America, by Joel Asaph Allen, assistant in the Museum of Comparative Zoology, at Cambridge, special collaborator of the Survey. 1880. xvi, 785 pp.

UNCLASSIFIED PUBLICATIONS.[a]

[1] Forty-second Congress, first session, House of Representatives Ex. Doc. No. 19. Final Report of the United States Geological Survey of Nebraska and portions of the adjacent Territories, made under the direction of the Commissioner of the General Land Office. By F. V. Hayden, United States geologist. March 23, 1871. Ordered to be printed. Washington: Government Printing Office 1872.

8°. 264 pp., 11 il., 11 pls., 1 map.

[Part I.] Geology, by F. V. Hayden, pp. 3–79.

Part II. Paleontology, Report on the paleontology of eastern Nebraska, with some remarks on the Carboniferous rocks of that district, by F. B. Meek. pp. 81–245, pls. 1–11.

Part III. Entomology, Notes on the Orthoptera collected by Dr. F. V. Hayden in Nebraska, by Samuel H. Scudder, pp. 247–261.

Index, pp. 263–264.

[2] List of elevations and distances in that portion of the United States west of the Mississippi River. Collated and arranged by Prof. C. Thomas, Asst. U. S. Geol. Surv., under Dr. F. V. Hayden. Washington: Government Printing Office. 1872.

12mo. 31 pp.

[3] Department of the Interior. United States Geological Survey of the Territories. F. V. Hayden, U. S. geologist in charge. Profiles, sections and other illustrations, designed to accompany the final report of the chief geologist of the Survey and sketched under his directions by Henry W. Elliott. Under authority of the Secretary of the Interior. New York. Julius Bien. 1872.

4°. 2 pp., 65 pls.

[4] Department of the Interior. United States Geological Survey of the Territories. F. V. Hayden, U. S. Geologist in charge. Synopsis of new vertebrata from the Tertiary of Colorado, obtained during the summer of 1873. By Professor E. D. Cope. [Extracted from the Seventh Annual Report of the United States Geological Survey of the Territories, F. V. Hayden, U. S. geologist-in-charge.] Washington: Government Printing Office. October, 1873.

8°. 19 pp.

NOTE.—Only quasi-extracted from the report of which it ostensibly forms part. It was published in advance of the Seventh Annual Report as a separate pamphlet, and finally appears in that report so much modified as to be in effect a different article.

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[a] Numbered arbitrarily for convenience in reference.

[5] Department of the Interior. Catalogue of the publications of the United States Geological Survey of the Territories. F. V. Hayden, geologist-in-charge. Washington: Government Printing Office. 1874.

8°. 20 pp.

[6] Department of the Interior. United States Geological and Geographical Survey of the Territories. F. V. Hayden, in charge. Catalogue of the photographs of the U. S. Geological and Geographical Survey of the Territories. By W. H. Jackson, photographer. Washington: Government Printing Office. 1875.

18mo. 51 pp.

[7] Department of the Interior. U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. The Grotto Geyser of the Yellowstone National Park. With a descriptive note and map, and an illustration by the Albert-type process. [n. d., n. p. Washington: Government Printing Office. 1876.]

Oblong folio. 1 p. l., 2 ll of text, 1 illustration, 1 map.

[8] Department of the Interior. Catalogue of the publications of the U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, geologist in charge. Second edition. (Revised to December 31, 1876.) Washington: Government Printing Office. 1877.

8°. 38 pp.

[9] Department of the Interior. U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, in charge. Bulletin of the United States Entomological Commission. Destruction of the young or unfledged locusts. No. 1. Washington: Government Printing Office. 1877.

8°. 12 pp.

[10] Department of the Interior. U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. Bulletin of the United States Entomological Commission. On the natural history of the Rocky Mountain locust, and on the habits of the young or unfledged insects as they occur in the more fertile country in which they will hatch the present year. No. 2. Washington: Government Printing Office. May, 1877.

8°. 15 pp.

[11] Department of the Interior. U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, in charge. Bulletin of the United States Entomological Commission. Destruction of the young or unfledged locusts. No. 1. Second edition. Washington: Government Printing Office. June 1877.

8°. 15 pp.

NOTE.—Somewhat modified from the first edition.

[12] Department of the Interior. U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. Bulletin of the United States Entomological Commission. On the natural history of the Rocky Mountain locust and on the habits of the young or unfledged insects as they occur in the more fertile country in which they will hatch the present year. No. 2. Second edition. Washington: Government Printing Office. June, 1877.

8°. 14 pp.

NOTE.—Somewhat modified from the first edition.

[13] Department of the Interior. Preliminary report of the field work of the U. S. Geological and Geographical Survey of the Territories for the season of 1877. Washington: Government Printing Office. 1877.

8°. 35 pp.

[14] Department of the Interior. United States Geological Survey. F.V. Hayden, U. S. geologist-in-charge. First "Annual Report of the United States Entomological Commission for the year 1877 relating to the Rocky Mountain locust and the best methods of preventing its injuries and of guarding against its invasions, in pursuance of an appropriation made by Congress for this purpose. With maps and illustrations. Washington: Government Printing Office. 1878.

8°. xvi, 477. 295 pp., 5 ll., 5 pls., 3 maps.

[15] Department of the Interior. U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, U. S. geologist-in-charge. Illustrations of Cretaceous and Tertiary plants of the western Territories of the United States. Washington: Government Printing Office. 1878.

4°. 28 ll., 28 pls.

[16] Department of the Interior. United States Geological and Geographical Survey. F. V. Hayden, U. S. geologist-in-charge. Preliminary report of the field work of the U. S. Geological and Geographical Survey of the Territories for the season of 1878. By F. V. Hayden. Washington: Government Printing Office. 1878.

8°. 29 pp.

[17] Department of the Interior Catalogue of the publications of the U. S. Geological and Geographical Survey of the Territories F. V. Hayden, United States geologist Third edition Revised to December 31, 1878. Washington: Government Printing Office. 1879.

8°. 54 pp.

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[a] The Second Annual Report of the Entomological Commission was published by the Department of the Interior; the Third Annual Report was published by the Department of Agriculture.

MAPS.

ATLAS OF COLORADO.

[FIRST EDITION.]

[Vignette] Department of the Interior. United States Geological and Geographical Surveys of the Territories. Geological and Geographical Atlas of Colorado and portions of adjacent territory by F. V. Hayden U. S. Geologist in charge. 1877 Julius Bien, Lith.

Folio, 2 ll. (title page and legend), 20 double folio atlas sheets.

Sheets I–IV are triangulation, drainage, land classification, and geologic maps of Colorado west of longitude 102°, on the scale of 12 miles to the inch.

Sheets V–XVI are topographic (contour) and geologic maps of Colorado and adjacent States, between meridians 104° 30′ and 109° 30′ and parallels 36° 45′ and 40° 30′, on the scale of 4 miles to the inch.

Sheets XVII and XVIII contain three geologic sections across the State, west of the longitude 104° 30′.

Sheets XIX and XX are panoramic views of the Pikes Peak group, Sawatch Range, central portion of West Elk Mountains, Twin Lakes, southwestern border of the Mesa Verde, San Juan Mountains, and La Plata Mountains.

[SECOND EDITION.]

[Vignette] Department of the Interior. United States Geological and Geographical Surveys of the Territories. Geographical and Geological atlas of Colorado and portions of adjacent territory by F. V. Hayden U. S. Geologist in charge Corrected to date and printed in accordance with an act of Congress approved February 9th, 1881. Julius Bien, Lith.

Folio, 2 ll. (title page and legend), 20 double folio atlas sheets. Contents same as first edition.

SEPARATE MAPS.[a]

GENERAL.

Map showing primary triangulation of 1877.

General geologic map of area explored from 1869 to 1880. Limiting meridians, 90° and 114°; limiting parallels, 35° and 48°. Scale, 41.03 miles to the inch.

COLORADO.

Land survey work in Colorado. Scale, 4 miles to the inch. Published for field use of Survey only.

Central Colorado, showing regions surveyed in 1873. Shows drainage only. Scale, 8 miles to the inch. Also in report for 1873.

[a] In the list below are given the maps issued independent of other publications. Maps accompanying the reports are listed in the "Index," pages 134–139.

Map showing primary and secondary triangulation of 1873. Limiting meridians, 104° 15′ and 107°; limiting parallels, 38° and 40° 30′. Scale, 8 miles to the inch. Also in report for 1873.

Preliminary map of the San Juan country. Shows drainage only. Limiting meridians, 106° 10′ and 108°; limiting parallels, 37° 15′ and 38° 15′. Scale, 4 miles to the inch. Also in Bull., vol. I, No. 3, 2d series.

Preliminary map of central Colorado, showing region surveyed in 1873 and 1874. Limiting meridians, 104° 30′ and 107° 30′; limiting parallels, 37° and 40° 30′. Also in report for 1874.

Drainage map of Colorado. Portion of State west of one hundred and second meridian. Scale, 12 miles to the inch. Also in Atlas of Colorado.

Economic map of Colorado, showing areas of arable, pasture, timber, desert, coal, and other lands. Portion of State west of one hundred and second meridian. Scale, 12 miles to the inch. Published also in Atlas of Colorado.

General geologic map of Colorado. Portion west of one hundred and second meridian. Scale, 12 miles to the inch. Also in Atlas of Colorado.

IDAHO.

Parts of Idaho, Montana, and Wyoming. Limiting meridians, 109° and 114°; limiting parallels, 43° and 46°. Hachure. Scale, 10 miles to the inch.

Sources of Snake River and portions of headwaters of Madison and Yellowstone rivers. Topography shown by brush work. Scale, 5 miles to the inch.

Geologic map on above base.

Drainage map of portions of Wyoming, Idaho, and Utah. Limiting meridians, 107° and 112° 30′; limiting parallels, 42° 45′ and 44°. Scale, 8 miles to the inch.

MONTANA.

Parts of Idaho, Montana, and Wyoming. Limiting meridians, 109° and 114°; limiting parallels, 43° and 46°. Hachure. Scale, 10 miles to the inch.

Montana and Wyoming Territories, embracing most of the country drained by Madison, Gallatin, and Upper Yellowstone rivers. Contour [illegible]terval, 100 feet. Scale, 4 miles to the inch.

Geologic map on same base.

UTAH.

Drainage map of portions of Wyoming, Idaho, and Utah. Limit- eridians, 107° and 112° 30′; limiting parallels, 42° 45′ and 44°. 8 miles to the inch.

WYOMING.

Yellowstone National Park. Limiting meridians, 110° and 111 : limiting parallels, 44° 10′ and 45°. Scale, 2 miles to the inch. Contour interval, 100 feet.

Geologic map on above base.

Yellowstone National Park. Hachure map. Scale, 10 miles to the inch. Also in report for 1871.

Upper Geyser Basin. Hachure. Scale, 600 feet to the inch.

Upper Geyser Basin. Hachure. Scale, 880 feet to the inch.

Upper Geyser Basin. Hachure. Scale, 500 feet to the inch.

Lower Geyser Basin. Hachure. Scale, 1,500 feet to the inch.

Lower Geyser Basin. Hachure. Scale, 880 feet to the inch.

Lower Geyser Basin. Hachure. Scale, 800 feet to the inch.

Gibbon Geyser Basin. Hachure. Scale, 200 feet to the inch.

Gibbon Geyser Basin. Hachure. Scale, 400 feet to the inch.

Shoshone Geyser Basin. Hachure. Scale, 125 feet to the inch.

Egeria Springs, Firehole River. Hachure. Scale, 250 feet to the inch.

Mammoth Hot Springs. Hachure. Scale, 400 feet to the inch.

Hot Springs on Witch Creek. Scale, 1,600 feet to the inch.

Yellowstone Lake. Scale, 2 miles to the inch.

Parts of Idaho, Montana, and Wyoming. Limiting meridians, 109° and 114°; limiting parallels, 43° and 46°. Hachure. Scale, 10 miles to the inch.

Montana and Wyoming Territories, embracing most of the country drained by Madison, Gallatin, and Upper Yellowstone rivers. Contour interval, 100 feet. Scale, 4 miles to the inch.

Geologic map on same base.

Sources of Snake River and portions of headwaters of Madison and Yellowstone rivers. Topography shown by brush work. Scale, 5 miles to the inch.

Geologic map on above base.

Geologic map of parts of central Wyoming. Limiting meridians, 107° and 109° 30′; limiting parallels, 41° 45′ and 43°. Scale, 4 miles to the inch.

Map showing primary triangulation of 1877–78. Scale, 12 miles to the inch.

Drainage map of portions of Wyoming, Idaho, and Utah. Limiting meridians, 107° and 112° 30′; limiting parallels, 42° 45′ and [illegible]. Scale, 8 miles to the inch.

UNITED STATES GEOLOGICAL EXPLORATION OF THE FORTIETH PARALLEL (KING).

ANNUAL REPORTS.

1871.

[Report of Clarence King, geologist in charge of the Geological Exploration of the 40th Parallel.] Annual Report of the Chief of Engineers to the Secretary of War for the year 1871. Appendix Z, pp. 1027–1030.

1872.

Geological Exploration of the 40th Parallel, from the Sierra Nevada to the eastern slope of the Rocky Mountains. Annual Report of Chief of Engineers to the Secretary of War for the year 1872, pp. 101–102.

1873.

Report of Mr. Clarence King, geologist, in charge of the Geological Exploration of the Fortieth Parallel, from Sierra Nevada to the eastern slope of the Rocky Mountains. Annual Report of the Chief of Engineers to the Secretary of War for 1873, Appendix DD, pp. 1203–1210.

1874.

Annual Report of Mr. Clarence King, geologist, for the fiscal year ending June 30, 1874. Annual Report of the Chief of Engineers to the Secretary of War for 1874, Part II, Appendix EE, pp. 477–480.

1875.

Annual Report of Mr. Clarence King, geologist, for the fiscal year ending June 30th, 1875. Annual Report of the Chief of Engineers to the Secretary of War for 1875, Part II, Appendix KK, pp 919–920.

1876.

Annual Report of Mr. Clarence King, geologist, for the fiscal year ending June 30, 1876. Annual Report of the Chief of Engineers to the Secretary of War for 1876, Part III, Appendix II, pp. 217–218.

1877.

Annual Report of Mr. Clarence King, geologist, for the fiscal year ending June 30, 1877. Annual Report of the Chief of Engineers to the Secretary of War for 1877, Part II, Appendix MM, p. 1207.

1878.

Annual Report of Clarence King, geologist, for the fiscal year ending June 30, 1878. Annual Report of the Chief of Engineers to the Secretary of War for 1878, Part III, Appendix MM, p. 1419.

FINAL REPORTS OR MONOGRAPHS.

[Vignette] Professional Papers of the Engineer Department, U. S. Army. No. 18. Report of the Geological Exploration of the Fortieth Parallel made by order of the Secretary of War according to acts of Congress of March 2, 1867, and March 3, 1869, under the direction of Brig. and Bvt. Major General A. A. Humphreys, Chief of Engineers, by Clarence King, U. S. geologist.

Volume I [-VII].

4°. 7 vols.

I. Systematic geology, by Clarence King, U. S. Geologist. 1878. xii, 803 pp., 16 tables, 28 pls. (2 pls. marked "Plate I," 1 pl. not numbered), 12 maps and atlas of 12 sheets folio.[a]

II. Descriptive geology, by Arnold Hague and S. F. Emmons. 1877. xiii, 890 pp., 26 pls.

III. Mining industry, by James D. Hague, with geological contributions by Clarence King. 1870. xv, 647 pp., 37 pls, frontispiece, and atlas of 14 sheets folio.[a]

IV. Part I, Palæontology, by F. B. Meek. Part II, Palæontology, by James Hall and R. P. Whitfield. Part III, Ornithology, by Robert Ridgway. 1877. xii, 669 pp., 18 ll., 24 pls.

V. Botany, by Sereno Watson, aided by Prof. Daniel C. Eaton and others. 1871. liii, 525 pp., 1 map, 40 pls.

VI. Microscopical petrography, by Ferdinand Zirkel. 1876. xv, 297 pp., 12 pls.

VII. Odontornithes: A monograph on the extinct toothed birds of North America, by Othniel Charles Marsh, professor of paleontology in Yale College. 1880. xv, 201 pp., 34 ll., 34 pls.

ATLAS.

[Vignette] Engineer Department, U. S. A., Geological and Topographical Atlas accompanying the report of the Geological Exploration of the Fortieth Parallel, made by authority of the Honorable Secretary of War, under the direction of Brig. and Bvt. Major General

[a] See p 40.

A. A. Humphreys, Chief of Engineers, U. S. A., by Clarence King, U. S. geologist-in-charge. 1876. Julius Bien Lith.

Folio, 2 ll., (title and legend), 1 single and 11 double folio sheets (1 single folio map, 10 double folio maps, 1 double folio section).

Contains topographic (shaded) map of Cordilleran region, limiting meridians 104° and 124°; limiting parallels 29° and 50°. Scale, 60 miles to the inch.

Also contains four geologic and four topographic (shaded) maps, on scale of 4 miles to the inch, of the following areas:

Sheet I. Longitude, 104° 30′–107° 37′; latitude, 40° 20′–41° 54′.
Sheet II. Longitude, 107° 37′–110° 43′; latitude, 40° 16′–41° 50′.
Sheet III. Longitude, 110° 43′–113° 50′; latitude, 40° 13′–41° 46′.
Sheet IV. Longitude, 113° 50′–116° 56′; latitude, 39° 55′–41° 29′.

[Vignette] United States Geological Exploration of the Fortieth Parallel, Clarence King, Geologist in charge. Atlas accompanying Volume III on mining industry. [List of plates.] Engraved and printed by Julius Bien, New York.

Folio, 1 l. (title page), 14 pls.

SPECIAL PUBLICATION.

United States Geological Exploration of the 40th Parallel. Clarence King, U. S. geologist-in-charge. List of plants collected in Nevada and Utah, 1867–69; numbered as distributed. Sereno Watson, collector.

UNITED STATES GEOGRAPHICAL AND GEOLOGICAL SURVEY OF THE ROCKY MOUNTAIN REGION (POWELL).

EARLY REPORTS BY J. W. POWELL.[a]

Forty-second Congress, second session, House of Representatives, Mis. Doc. No 173. Survey of the Colorado River of the West. Letter from the Secretary of the Smithsonian Institution, transmitting report preliminary for continuing the survey of the Colorado of the West and its tributaries, by Professor Powell. April 5, 1872.—Referred to the Committee on Appropriations and ordered to be printed.

8°. 12 pp.

Forty-second Congress, third session, House of Representatives, Mis. Doc. No 76. Report of the survey of the Colorado of the West. Letter from the Secretary of the Smithsonian Institution, transmitting a report of the survey of the Colorado of the West and its tributaries. January 31, 1873.—Referred to the Committee on Appropriations and ordered to be printed.

8°. 16 pp.

Forty-third Congress, first session, House of Representatives, Mis. Doc. No 265. Professor Powell's Report on the survey of the Colorado of the West. Letter from the Secretary of the Smithsonian Institution, transmitting a report of Professor Powell on the survey of the Colorado River of the West and its tributaries, etc., etc. May 2, 1874. Referred to the Committee on Appropriations and ordered to be printed.

8°. 29 pp.

Report of explorations in 1873 of the Colorado of the West and its tributaries, by Professor J. W. Powell, under the direction of the Smithsonian Institution. Washington: Government Printing Office. 1874.

8°. 36 pp. (Same as House Mis Doc. 265, 43d Cong., 1st sess.).

Exploration of the Colorado River of the West and its tributaries. Explored in 1869, 1870, 1871, and 1872, under the direction of the Secretary of the Smithsonian Institution. [By J. W. Powell.] Washington: Government Printing Office. 1875

4°. xi, 291 pp., 2 ll., 72 illustrations.

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[a] These reports were issued before the Powell survey was organized, but they are preliminary to the publications of that organization.

FINAL REPORTS.

Department of the Interior. U. S. Geological and Geographical Survey of the Territories. Second division.—J. W. Powell, geologist in charge. Report on the geology of the eastern portion of the Uinta Mountains and a region of country adjacent thereto. With atlas. By J. W. Powell. Washington: Government Printing Office. 1876

4°, vii, 218 pp., 4 illustrations and atlas of 8 sheets folio.

Report on the Geological and Geographical Survey of the Rocky Mountain region, by J. W. Powell. Washington: Government Printing Office. 1877.

8°. 19 pp., 1 map.

U. S. Geographical and Geological Survey of the Rocky Mountain Region. J. W. Powell, in charge. Preliminary report on the paleontology of the Black Hills, by R. P. Whitfield, containing descriptions of new species of fossils from the Potsdam, Jurassic, and Cretaceous formations of the Black Hills of Dakota. Washington: Government Printing Office. July, 1877.

8°. 49 pp.

Department of the Interior. U. S. Geographical and Geological Survey of the Rocky Mountain Region. J. W. Powell, in charge. Report on the geology of the Henry Mountains. By G. K. Gilbert. [Seal of the Department] Washington: Government Printing Office. 1877 [second edition, 1880]

4°. x, 160 pp., 27 ll. containing illustrations

Report on the lands of the arid region of the United States, with a more detailed account of the lands of Utah. With maps. By J. W. Powell. Second edition.[a] Washington: Government Printing Office. 1879.

4°. xv, 195 pp., 5 maps.

Department of the Interior. U. S. Geographical and Geological Survey of the Rocky Mountain Region. J. W. Powell, in charge. Report on the geology and resources of the Black Hills of Dakota, with atlas, by Henry Newton, E. M., and Walter P. Jenney, E. M. [Seal of the Department] Washington. Government Printing Office. 1880.

4°. xvii, 566 pp., 23 ll., frontispiece, 28 illustrations and atlas containing 3 sheets folio.

Department of the Interior. U. S. Geographical and Geological Survey of the Rocky Mountain Region. J. W. Powell, in charge, Report on the geology of the high plateaus of Utah, with atlas, by C. E.

[a] First edition was published as a document of Congress.

Dutton, Captain of Ordnance, U. S. A. [Seal of the Department] Washington Government Printing Office 1880

4°. xxxii, 307 pp., 11 heliotypes, 2 pls., 2 unnumbered illustrations, atlas of 8 sheets folio.

CONTRIBUTIONS TO NORTH AMERICAN ETHNOLOGY.

Department of the Interior. U. S. Geographical and Geological Survey of the Rocky Mountain region. J. W. Powell in charge. [Vol. I, geologist in charge] Contributions to North American Ethnology. Volume I [–VII, IX] [Seal of the Department] Washington: Government Printing Office. 1877 [–1893]

4° 9 vols.

I. Tribes of the extreme Northwest, by W. H. Dall. Tribes of western Washington and northwestern Oregon, by Geo. Gibbs. 1877. xiv, 361 pp., 10 illustrations, 2 maps.

Part I. Tribes of the extreme Northwest, by W. H. Dall, pp. 1–106.

Appendix to Part I. Linguistics.

Notes on the natives of Alaska (communicated to the late George Gibbs, M. D., in 1862), by his excellency J. Furuhelm, late governor of the Russian-American colonies, pp. 111–116.

Terms of relationship used by the Innuit: A series obtained from natives of Cumberland Inlet, by W. H. Dall, pp. 117–119.

Comparative vocabularies [by George Gibbs and W. H. Dall], pp. 121–153.

Note on the use of numerals among the T'sim Si an', by George Gibbs, M. D., pp. 155–156.

Part II. Tribes of western Washington and northwestern Oregon, by George Gibbs, M. D., pp. 157–241.

Appendix to Part II. Linguistics, pp. 243–361.

Comparative vocabularies [by George Gibbs, W. F. Tolmie, and Gregory Mengarini], pp. 243–283.

Dictionary of the Niskwalli, by George Gibbs, M. D., pp. 285–361.

II. The Klamath Indians of southwestern Oregon, by Albert Samuel Gatschet. 1890. 2 parts. cvii, 711 pp., 1 map; iii, 711 pp.

III. Tribes of California, by Stephens Powers. 1877. 3 ll., 645 pp., frontispiece, 45 ll. containing illustrations, pocket map.

IV. Houses and house life of the American aborigines, by Lewis H. Morgan. 1881. xiv, 281 pp., frontispiece, 28 ll. containing figures.

V. 1881. iii, 112, 32, xxxvii, 237 pp., 18 pls., 35 ll. containing figures.

Observations on cup-shaped and other lapidarian sculptures in the Old World and in America, by Charles Rau, iii, 112 pp., 35 ll.

On prehistoric trephining and cranial amulets, by Robert Fletcher, M. R. C. S. Eng. Act. Asst. Surgeon U. S. Army, 32 pp., 9 pls.

A study of the manuscript Troano, by Cyrus Thomas, Ph. D., with an introduction by D. G. Brinton, M. D., xxxvii, 237 pp., 9 pls.

VI. The Ҫegiha language, by James Owen Dorsey. 1890. xviii, 794 pp.

VII. A Dakota-English dictionary, by Stephen Return Riggs; edited by James Owen Dorsey. 1890, x, 665 pp.

VIII. Not published.

IX. Dakota grammar, texts, and ethnography, by Stephen Return Riggs, edited by James Owen Dorsey. 1893. pp.

UNITED STATES GEOGRAPHICAL SURVEYS WEST OF THE ONE HUNDREDTH MERIDIAN (WHEELER).

ANNUAL REPORTS.

1869.

Engineer Department, U. S. Army. Preliminary report upon a reconnaissance through southern and southeastern Nevada, made in 1869, by First Lieut. Geo. M. Wheeler, Corps of Engineers, U. S. Army, assisted by First Lieut. D. W. Lockwood, Corps of Engineers, U. S. Army, under the orders of Brig. Gen. E. O. C. Ord, Bvt. Maj. Gen. U. S. Army, commanding Department of California. Washington: Government Printing Office. 1875.

4°. 72 pp.

1871.

Preliminary report concerning explorations and surveys principally in Nevada and Arizona. Prosecuted in accordance with paragraph 2, special orders No. 109, War Department, March 18, 1871, and letter of instructions of March 23, 1871, from Brig. Gen. A. A. Humphreys, Chief of Engineers. Conducted under the immediate direction of 1st Lieut. George M. Wheeler, Corps of Engineers. 1871. Washington: Government Printing Office. 1872.

4°. 96 pp., 1 map.

[Progress report], pp. 11–62.

Appendix A. Report of Daniel W. Lockwood, First Lieutenant of Engineers, pp. 62–76.

Appendix B. Report of Second Lieutenant D. A. Lyle, United States Artillery, pp. 76–90.

Appendix C. Report of Edward P. Austin, astronomical assistant, pp. 91–92.

Appendix D. Report of G. K. Gilbert, geological assistant, pp. 92–96.

1872.

Engineer Department, United States Army. Progress report upon geographical and geological explorations and surveys west of the one hundredth meridian, in 1872, under the direction of Brig. Gen. A. A. Humphreys, Chief of Engineers, United States Army, by First Lieut. George M. Wheeler, Corps of Engineers, in charge. Washington: Government Printing Office. 1874.

4°. 56 pp., 5 pls. and 1 map.

[Progress report], pp. 7–43, pls. i–v, map.

Appendix A. Preliminary astronomical report, by John H. Clark, astronomical *assistant, pp.* 44–45.

Appendix B. Preliminary astronomical report, by William W. Maryatt, astronomical assistant, pp. 45–47.

Appendix C. Report by First Lieut. W. L. Marshall concerning the sextant astronomical observations, pp. 47–48.

Appendix D. Preliminary geological report, by G. K. Gilbert, chief geological assistant, expedition of 1872, pp. 48–52.

Appendix E. Report upon natural history collections, by Acting Assistant Surgeon H. C. Yarrow, surgeon and naturalist, pp. 52–55.

Appendix F. Preliminary ethnological report by M. S. Severance, pp. 55–56.

1873.

Annual report upon the geographical surveys and explorations west of the one hundredth meridian, in Nevada, Utah, Colorado, New Mexico, and Arizona, by George M. Wheeler, First Lieutenant of Engineers, U. S. A.; being Appendix EE of the Annual Report of the Chief of Engineers for 1873. Washington: Government Printing Office. 1873.

8°. 11 pp., 1 map.

1874.

Annual report upon the geographical explorations and surveys west of the one hundredth meridian, in California, Nevada, Utah, Arizona, Colorado, New Mexico, Wyoming, and Montana, by George M. Wheeler, First Lieutenant of Engineers, U. S. A.; being Appendix FF of the Annual Report of the Chief of Engineers for 1874. Washington: Government Printing Office. 1874.

8°. 130 pp., 1 map.

[Progress report], pp. 3–112, map.

Plan for publication of reports and maps, with estimates. Summary of publications to present time, pp. 112–114.

Notes on the Eocene and Pliocene lacustrine formations of New Mexico, including descriptions of certain new species of vertebrates, by Prof. E. D. Cope, paleontologist to the expedition, pp. 115–130.

1875.

Annual report upon the geographical explorations and surveys west of the one hundredth meridian in California, Nevada, Nebraska, Utah, Arizona, Colorado, New Mexico, Wyoming and Montana, by George M. Wheeler, First Lieutenant of Engineers, U. S. A.; being Appendix LL of the Annual Report of the Chief of Engineers for 1875. Washington: Government Printing Office. 1875

8°. iv, 196 pp., 2 ll., 9 pls., 2 maps, 1 diagram.

[Progress report], pp. 3–37, pl. i, 2 maps.

Appendix A. Executive report of Lieutenant William L. Marshall, Corps of Engineers, on the operations of party No. 1, division 1, field season of 1874, pp. 37–40.

Appendix B. Executive report of Lieutenant P. M. Price, Corps of Engineers, on the operations of party No. 1, second division, field season of 1874, pp. 40–41.

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Notes on economic botany, by J. T. Rothrock, surgeon and botanist to the expeditions of 1873, 1874, and 1875, pp. 39–52.

Catalogue of plants collected in Nevada, Utah, Colorado, New Mexico, and Arizona, with descriptions of those not contained in Gray's Manual of the Northern U. S., and Vol. V, Geological Exploration of the Fortieth Parallel, by J. T. Rothrock, surgeon and botanist to the expeditions of 1873, 1874, and 1875, and the following botanists: Sereno Watson, Cambridge, Mass.; George Engelmann, M. D., St. Louis, Mo.; Prof. T. C. Porter, Easton, Pa.; M. S. Bebb, Fountaindale, Ill.; Wm. Boott, Boston, Mass.; George Vasey, M. D., Agricultural Department, Washington, D. C.; Prof. D. C. Eaton, Yale College, New Haven, Conn.; Thos. P. James, Cambridge, Mass.; Prof. Edward Tuckerman, Amherst, Mass., pp. 53–351.

[Notes on that portion of California traversed by the botanists of the expeditions of 1875, with enumeration of plants collected during that year], pp. 353–378.

Table of orders, p. 379.

Index, pp. 381–400.

Description of plates, pp. 401–404.

VII. Archæology. 1879. xxi, 497 pp., 20 pls., frontispiece. 1 map.

Part I. Reports upon archæological and ethnological collections, by Frederick W. Putnam, curator of the Peabody Museum, Cambridge, Mass., assisted by C. C. Abbott, M. D.; S. S. Haldeman, LL. D.; H. C. Yarrow, M. D.; H. W. Henshaw, and Lucien Carr, assistant curator Peabody Museum.

The southern Californians, pp. 1–31.

Report on the operations of a special party for making ethnological researches in the vicinity of Santa Barbara, Cal., with a short historical account of the region explored, by Dr. H. C. Yarrow, acting assistant surgeon, United States Army, pp. 32–47.

Chipped stone implements, by C. C. Abbott, pp. 49–69, pls. i–iv.

Mortars and pestles, by C. C. Abbott, pp. 70–92, pl. v.

Steatite cooking pots, plates, and food vessels, by C. C. Abbott, pp. 93–116, pl. vi.

The method of manufacture of soapstone pots, by Paul Schumacher, pp. 117–121.

Articles made of wood, by C. C. Abbott, pp. 122–124.

Smoking pipes of stone, by C. C. Abbott, pp. 125–134, pls. vii–ix.
Perforated stones, pp. 135–189, pl. x.
Miscellaneous objects made of stone, by C. C. Abbott, pp. 190–217.
Sculptures, pp. 218–221.
Implements and weapons made of bone and wood, by C. C. Abbott and F. W. Putnam, pp. 222–233, pl. xi.
Musical instruments made of bones, by C. C. Abbott, pp. 234–238.
Textile fabrics, basket work, etc., pp. 239–250, pl. xiv.
Ornaments, pp. 251–262, pl. xii.
Beads, by S. S. Haldeman, pp. 263–271, pl. xiii.
Iron implements and other articles obtained by contact with Europeans, pp. 272–276, pl. xv.
Observations on the crania from the Santa Barbara Islands, California, by Lucien Carr, assistant curator of the Peabody Museum American Archæology and Ethnology, pp. 277–292.
Translation from the Spanish of the account by the pilot Ferrel of the voyage of Cabrillo along the west coast of North America in 1542, with introductory notes by H. W. Henshaw, pp. 293–314. 1 map.
Part II. The pueblo ruins and the interior tribes, by Frederick W. Putnam, curator of the Peabody Museum, Cambridge, Mass., pp. 315–397.
Notes on the pueblos and their inhabitants, by G. Thompson, topographer, pp. 319–324.
The pueblo of Acoma, by Dr. Oscar Loew, pp. 325–326.
The pueblo of Taos, by H. C. Yarrow, assistant surgeon, U. S. A., pp. 327–330.
The pueblo of San Juan, by H. C. Yarrow, assistant surgeon, U. S. A., p. 331.
The cachina, a dance at the pueblo of Zuñi, by Francis Klett, assistant United States Geographical Surveys west of the one hundredth meridian, pp. 332–336.
Report on the ruins in New Mexico, by Dr. Oscar Loew, pp. 337–345.
Report on ruins visited in New Mexico, by Lieut. Rogers Birnie, jr., Thirteenth United States Infantry, pp. 346–350.
Report on the remains of population observed in northwestern New Mexico, by Prof. E. D. Cope, palæontologist of expedition of 1874, pp. 351–361.
Notice of a ruined pueblo and an ancient burial place in the valley of the Rio Chama, by H. C. Yarrow, assistant surgeon, U. S. A., pp. 362–365.
Notice of the pueblo Pintado and of other ruins in the Chaco Canyon, by Lieut. C. C. Morrison, Sixth United States Cavalry, pp. 366–369.
Cliff house and cave on Diamond Creek, New Mexico, by H. W. Henshaw, pp. 370–371.
Ruins in the Cañon de Chelle, pp. 372–373, pl. xx.
Notes on the implements of stone, pottery, and other objects obtained in New Mexico and Arizona, pp. 374–390, pls. xvi–xix.
Notes upon human crania and skeletons collected by the expeditions of 1872–1874, by Mark Sibley Severance and Dr. H. C. Yarrow, pp. 391–397.
Appendix. Linguistics, pp. 399–485.
Classification into 7 linguistic stocks of western Indian dialects contained in 40 vocabularies, by Albert S. Gatschet, pp. 403–485.
Index, pp. 487–497.

UNCLASSIFIED PUBLICATIONS.[a]

[1] Tables of camps, distances, lines of march, etc. Surveys and explorations in Nevada and Arizona, Lieut. Geo. M. Wheeler, U. S. Army, in charge. Washington, 1871. Oblong folio, 14 pp.

[2] Tables containing camps, distances, lines of march, latitudes, longitudes, attitudes, etc. Explorations and surveys west of the one hundredth meredian in Utah, Nevada, and Arizona, in charge of 1st Lieut. Geo. M. Wheeler, Corps of Engineers, assisted by 1st Lieuts. R. L. Hoxie and Wm. L. Marshall, Corps of Engineers. Accompanied by a map. Field season of 1872. Washington: Government Printing Office, 1873.

4°. 20 double pages, 1 l., map.

[3] [Vignette] Report upon the determination of the astronomical coordinates of the primary stations at Cheyenne, Wyoming Territory, and Colorado Springs, Colorado Territory, made during the years 1872 and 1873, geographical and geological explorations and surveys west of the one hundredth meridian. First Lieutenant George M. Wheeler, Corps of Engineers, in charge. Dr. F. Kampf and J. H. Clark, civilian astronomical assistants. Washington: Government Printing Office. 1874.

4°. 82 pp.

[4] Engineer Department, U. S. Army. Geographical and geological explorations and surveys west of the one hundredth meridian. First Lieut. Geo. M. Wheeler, Corps of Engineers, in charge. Report upon ornithological specimens collected in the years 1871, 1872, and 1873. Washington: Government Printing Office. 1874.

8°. 148 pp.

Report upon and list of birds collected by the expedition for explorations west of the one hundredth meridian in 1872; Lieut. Geo. M. Wheeler, Corps of Engineers, in charge, by Dr. H. C. Yarrow and Henry W. Henshaw, pp. 5–38.

I. An annotated list of the birds of Utah, by H. W. Henshaw, pp. 39–148.

[5] Engineer Department, U. S. Army. Geographical and geological explorations and surveys west of the one hundredth meridian. First Lieutenant Geo. M. Wheeler, Corps of Engineers, in charge. Catalogue of plants collected in the years 1871, 1872, and 1873, with descriptions of new species. Washington: Government Printing Office. 1874.

8°. 62 pp.

Botanical report, by Sereno Watson, pp. 5–19.

Preliminary report on the botany of central Colorado, pp. 23–62.

[6] Engineer Department, U. S. Army. Geographical and geological explorations and surveys west of the one hundredth meridian.

[a] Numbered arbitrarily for convenience in reference.

First Lieut. Geo. M. Wheeler, Corps of Engineers, in charge. Preliminary report upon invertebrate fossils collected by the expeditions of 1871, 1872, and 1873, with descriptions of new species. C. A. White, M. D. Washington: Government Printing Office. 1874.

8°. 27 pp.

[7] Geographical and geological explorations and surveys west of the 100th meridian. First Lieut. Geo. M. Wheeler, Corps of Engineers, in charge. Annotated list of birds of Utah, by H. W. Henshaw, ornithologist to the expedition. [From Annals New York Lyceum Natural History, Vol. XI.] Salem: Printed at the Salem Press. 1874.

8°. 14 pp.

[8] Geographical and geological explorations and surveys west of the 100th meridian. First Lieutenant G. M. Wheeler, Corps of Engineers, U. S. A., in charge. On the Plagopterinæ and the ichthyology of Utah, by Edward D. Cope, A. M. Reprinted from the Proceedings of American Philosophical Society, of Philad'a. Philadelphia: McCalla & Stavely, Prs., 237–9 Dock street. 1874.

8°. 14 pp.

[9] Engineer Department, U. S. Army. Geographical explorations and surveys west of the 100th meridian. First Lieut. Geo. M. Wheeler, Corps of Engineers, in charge. Systematic catalogue of vertebrata of the Eocene of New Mexico, collected in 1874. E. D. Cope, A. M., paleontologist. Washington: Government Printing Office. April 17, 1875.

8°. 37 pp.

[10] Engineer Department, U. S. Army. Instructions for taking and recording meteorological observations and for preserving and repairing the instruments; prepared for the use of field and astronomical parties of the expeditions for geographical surveys and explorations west of the one hundredth meridian. Compiled from Colonel Williamson's Use of the Barometer, and from the published instructions of the United States lake survey, with such additions and modifications as have been suggested by the experience of this survey; by First Lieutenants R. L. Hoxie and Wm. L. Marshall, Corps of Engineers, U. S. Army. To which are appended barometrical Tables I to XI, inclusive, of Professional Papers Corps of Engineers, No. 12. Washington: Government Printing Office. 1875.

16°. 64 pp.

[11] Geographical explorations and surveys west of the 100th meridian. Logarithm, Traverse, and Altitude tables. Washington: Government Printing Office. 1875.

8°. 30 pp.

[12] Engineer Department, U. S. Army. Instructions for taking, recording, and reducing meteorological observations, and for preserving and repairing the instruments. Prepared for the use of United States Geographical Surveys west of the 100th meridian. First Lieut. Geo. M. Wheeler, Corps of Engineers, U. S. Army, in charge. By First Lieutenants R. L. Hoxie and Wm. L. Marshall, Corps of Engineers, U. S. Army. To which are appended barometical Tables I to XI, inclusive, of Professional Papers, Corps of Engineers, No. 12. Washington: Government Printing Office. 1876.

8°. 88 pp.

[13] Field list of time stars, for the use of the U. S. Geographical Surveys west of the 100th meridian. Washington. 1878.

8°. 13 pp.

[14] U. S. Geographical Surveys west of the 100th meridian, Lieut. Geo. M. Wheeler, U. S. Army, in charge. List of longitudes, latitudes, and altitudes, being an extract from Vol. II. Washington. 1878.

4°. 22 pp., with blank tables.

[15] Engineer Department, United States Army. Catalogue of the mean declination of 2,018 stars between 0^h to 2^h and 12^h to 24^h right ascension, and 10° and 70° of north declination, for January 1, 1875. Prepared under the direction of First Lieut. Geo. M. Wheeler, Corps of Engineers, U. S. Army, in charge of U. S. Geographical Surveys west of the 100th meridian, by T. H. Safford, Ph. D., Field Memorial Professor of Astronomy in Williams College, Mass. Washington: Government Printing Office. 1879.

4°. 207 pp., 1 l.

[16] [Vignette.] Engineer Department, U. S. Army. Tables of geographic positions, azimuths, and distances, together with lists of barometric altitudes, magnetic declinations, and itineraries of important routes, prepared principally by First Lieut. M. M. Macomb, 4th U. S. Artillery, assistant, from data gathered by parties of the United States Geographical Surveys west of the 100th meridian, operating in the States and Territories of California, Colorado, Nebraska, Nevada, Oregon, Arizona, Idaho, Montana, New Mexico, and Wyoming, under the direction of Capt. Geo. M. Wheeler, Corps of Engineers, U. S. Army, in charge. 1883. Washington: Government Printing Office. 1885.

4°. 261 pp.

MAPS.

The following maps were issued in addition to those accompanying the annual reports and other publications. The greater part of these constitute parts of an atlas which it was intended should embrace all of the United States west of the one hundredth meridian. These sheets include topographic, geologic, and land-classification maps. The others are maps of special areas. All the atlas sheets and special maps issued are listed below.

ATLAS SHEETS.

TOPOGRAPHIC MAPS.

Topographic atlas sheets, arranged by States.

ARIZONA.

No.	Limiting meridians.	Limiting parallels.	Area.	Scale.	Remarks.
	° ′ ″ ° ′ ″	° ′ ° ′	*Sq. miles.*		
66.....	113 45 0 to 116 30 0	35 40 to 37 20	17,588	1 : 506880	Hachure map, 4 editions.
67[a].....	111 0 0 to 113 45 0	35 40 to 37 20	17,588	1 : 506880	2 editions, hachure and shaded.
75[a].....	111 0 0 to 113 45 0	34 0 to 35 40	17,952	1 : 506880	Hachure map.
76[a].....	108 15 0 to 111 0 0	34 0 to 35 40	17,952	1 : 506880	Do.
83[a].....	108 15 0 to 111 0 0	32 20 to 34 0	18,302	1 : 506880	Do.

CALIFORNIA.

38 B.....	119 15 0 to 120 37 30	41 30 to 42 20	4,075	1 : 253440	Hachure map.
38 D.....	119 15 0 to 120 37 30	40 40 to 41 30	4,127	1 : 253440	Do.
47 A[b]....	120 37 30 to 122 0 0	39 50 to 40 40	4,178	1 : 253440	Do.
47 B.....	119 15 0 to 120 37 30	39 50 to 40 40	4,178	1 : 253440	Do.
47 D	119 15 0 to 120 37 30	39 0 to 39 50	4,228	1 : 253440	Do.
47 B and 47 D.[b]	119 15 0 to 120 37 30	38 55 to 40 40	8,832	1 : 253440	2 editions; 1 with and 1 without hachure.
56 B.....	119 15 0 to 120 37 30	38 10 to 39 0	4,278	1 : 253440	Hachure map.
56 D.....	119 15 0 to 120 37 30	37 20 to 38 10	4,326	1 : 253440	Do.
57.....	116 30 0 to 119 15 0	37 20 to 39 0	17,209	1 : 506880	Do.
65.....	116 30 0 to 119 15 0	35 40 to 37 20	17,588	1 : 506880	Do.
65 D[b]....	116 30 0 to 117 52 30	35 40 to 36 30	4,420	1 : 253440	Do.
66.....	113 45 0 to 116 30 0	35 40 to 37 20	17,588	1 : 506880	Hachure map; 4 editions.
73.....	116 30 0 to 119 15 0	34 00 to 35 40	15,167	1 : 506880	Hachure map.
73 A[b]....	117 52 30 to 119 15 0	34 50 to 35 40	4,466	1 : 253440	Do.
73 C[b]....	117 52 30 to 119 15 0	34 0 to 34 50	4,510	1 : 253440	Do.

[a] Geologic map also issued for this area.
[b] Land classification map also issued for this area.

Topographic atlas sheets, arranged by States—Continued.

COLORADO.

No.	Limiting meridians.	Limiting parallels.	Area.	Scale.	Remarks.
	° ′ ″ ° ′ ″	° ′ ° ′	*Sq. miles.*		
52 D[a]	105 30 0 to 106 52 30	39 0 to 39 50	4,228	1 : 253440	Hachure map.
53 C	104 7 30 to 105 30 0	39 0 to 39 50	4,228	1 : 253440	Do.
61 A[a]	106 52 30 to 108 15 0	38 10 to 39 0	4,278	1 : 253440	2 editions; hachure map and contour map.
61 B[a]	105 30 0 to 106 52 30	38 10 to 39 0	4,278	1 : 253440	Hachure map, 3 editions.
61 C[a]	106 52 30 to 108 15 0	37 20 to 38 10	4,326	1 : 253440	3 editions, first without relief, other 2 hachured.
61 C[a]	107 15 0 to 107 57 0	37 42 to 38 7	1,100	1 : 126720	Contour map; 3 editions.
61 D[a]	105 30 0 to 106 52 30	37 20 to 38 10	4,326	1 : 253440	Hachure map.
62 A[a]	104 7 30 to 105 30 0	38 10 to 39 0	4,278	1 : 253440	Hachure map; 2 editions.
62 C[a]	104 7 30 to 105 30 0	37 20 to 38 10	4,326	1 : 253440	Do.
62 D	102 45 0 to 104 7 30	37 20 to 38 10	4,326	1 : 253440	Hachure map.
69	105 30 0 to 108 15 0	35 40 to 37 20	17,588	1 : 506880	Do.
69 B[b]	105 30 0 to 106 52 30	36 30 to 37 20	4,374	1 : 253440	Do.
70 A[b]	104 7 30 to 105 30 0	36 30 to 37 20	4,374	1 : 253440	Do.

IDAHO.

32 C[a]	112 22 30 to 113 45 0	42 20 to 43 10	4,023	1 : 253440	Hachure map.
32 D[a]	111 0 0 to 112 22 30	42 20 to 43 10	4,023	1 : 253440	Do.
41 A[a]	112 22 30 to 113 45 0	41 30 to 42 20	4,075	1 : 253440	Do.
41 B[a]	111 0 0 to 112 22 30	41 30 to 42 20	4,075	1 : 253440	Do.

NEVADA.

38 B	119 15 0 to 120 37 30	41 30 to 42 20	4,075	1 : 253440	Hachure map.
38 D[a]	119 15 0 to 120 37 30	40 40 to 41 30	4,127	1 : 253440	Do.
47 B	119 15 0 to 120 37 30	39 50 to 40 40	4,178	1 : 253440	Do.
47 D	119 15 0 to 120 37 30	39 0 to 39 50	4,228	1 : 253440	Do.
47 B and 47 D[a]	119 15 0 to 120 37 30	38 55 to 40 40	8,832	1 : 253440	2 editions; 1 with and 1 without hachures.
48 C	117 52 30 to 119 15 0	39 0 to 39 50	4,228	1 : 253440	Hachure map.
48 D	116 30 0 to 117 52 30	39 0 to 39 50	4,228	1 : 253440	Do.
49	113 45 0 to 116 30 0	39 0 to 40 40	16,814	1 : 506880	2 editions; hachure and shaded.
56 B	119 15 0 to 120 37 30	38 10 to 39 0	4,278	1 : 253440	Do.
57	116 30 0 to 119 15 0	37 20 to 39 0	17,209	1 : 506880	Do.
58	113 45 0 to 116 30 0	37 20 to 39 0	17,208	1 : 506880	4 editions; 3 hachured and 1 shaded.
65	116 30 0 to 119 15 0	35 40 to 37 20	17,588	1 : 506880	Hachure map.
66	113 45 0 to 116 30 0	35 40 to 37 20	17,588	1 : 506880	Hachure map; 4 editions.

[a] Land classification map also issued for this area.
[b] Land classification and geologic maps also issued for this area.

Topographic atlas sheets, arranged by States—Continued.

NEW MEXICO.

No.	Limiting meridians.	Limiting parallels.	Area.	Scale.	Remarks.
	° ′ ″ ° ′ ″	° ′ ° ′	*Sq. miles.*		
69.....	105 30 0 to 108 15 0	35 40 to 37 20	17,588	1 : 506880	Hachure map.
69 B[a]	105 30 0 to 106 52 30	36 30 to 37 20	4,374	1 : 253440	Do.
69 D[a]	105 30 0 to 106 52 30	35 40 to 36 30	4,420	1 : 253440	Hachure map; 3 editions.
70 A[b]	104 7 30 to 105 30 0	36 30 to 37 20	4,374	1 : 253440	Hachure map.
70 C[b]	104 7 30 to 105 30 0	35 40 to 36 30	4,420	1 : 253440	Do.
76[c]	108 15 0 to 111 0 0	34 0 to 35 40	17,952	1 : 506880	Do.
77[a]	105 30 0 to 108 15 0	34 0 to 35 40	17,952	1 : 506880	Do.
77 B[a]	105 30 0 to 106 52 30	34 50 to 35 40	4,465	1 : 253440	Do.
77 D[a]	105 30 0 to 106 52 30	34 0 to 34 50	4,510	1 : 253440	Do.
78 A[a]	104 7 30 to 105 30 0	34 50 to 35 40	4,465	1 : 253440	Do.
88[c]	108 15 0 to 111 0 0	32 20 to 34 0	18,302	1 : 506880	Do.
84[a]	105 30 0 to 108 15 0	32 20 to 34 0	18,302	1 : 506880	Do.
84 B[a]	105 30 0 to 106 52 30	33 10 to 34 0	4,554	1 : 253440	Hachure map; 2 editions.
84 C[a]	106 52 30 to 108 15 0	32 20 to 33 10	4,597	1 : 253440	Hachure map.

OREGON.

38 B.....	119 15 0 to 120 37 30	41 30 to 42 20	4,075	1 : 253440	Hachure map.

UTAH.

41 A[a]	112 22 30 to 113 45 0	41 30 to 42 20	4,075	1 : 253440	Hachure map.
41 B[a]	111 0 0 to 112 22 30	40 30 to 42 20	4,075	1 : 253440	Do.
49.....	113 45 0 to 116 30 0	39 0 to 40 40	16,814	1 : 506880	2 editions; hachure and shaded.
50[b]	111 0 0 to 113 45 0	39 0 to 40 40	16,814	1 : 506880	4 editions; 3 hachure 1 shaded.
58.....	113 45 0 to 116 30 0	37 20 to 39 0	17,208	1 : 506880	Do.
59[b]	111 0 0 to 113 45 0	37 20 to 39 0	17,208	1 : 506880	6 editions; 5 hachure 1 shaded.
66.....	113 45 0 to 116 30 0	35 40 to 37 20	17,588	1 : 506880	Hachure map; 1 editions.
67.....	111 0 0 to 113 45 0	35 40 to 37 20	17,588	1 : 506880	Hachure and shaded.

WYOMING.

32 D[a]	110 0 0 to 112 22 30	42 20 to 43 10	4,023	1 : 253440	Hachure map.

[a] Land classification map also issued for this area.
[b] Land classification and geologic maps also issued for this area.
[c] Geologic maps also issued for this area.

GEOLOGIC MAPS.

Geologic maps, arranged by States.[a]

ARIZONA.

No.	Limiting meridians.	Limiting parallels.	Area.	Scale.	Remarks.
	° ′ ″ ° ′ ″	° ′ ° ′	*Sq. miles.*		
66	113 45 0 to 114 48 40	35 40 to 37 20	6,960	1 : 506880	On sheet with part of 58.
67	111 0 0 to 113 45 0	35 40 to 37 20	17,588	1 : 506880	
75	111 0 0 to 113 45 0	34 0 to 35 40	17,952	1 : 506880	
76	108 15 0 to 111 0 0	34 0 to 35 40	17,952	1 : 506880	
83	108 15 0 to 111 0 0	32 20 to 34 0	18,302	1 : 506880	

COLORADO.

69 B	105 30 0 to 105 50 0	36 35 to 37 20	988	1 : 253440	On sheet with parts of 69 D, 77 B, and 78 A.
70 A[b]	104 7 30 to 105 30 0	36 30 to 37 20	4,374	1 : 253440	

NEVADA.

58	113 45 0 to 114 50 40	37 20 to 39 0	6,860	1 : 506880	On sheet with portion of 66.
66	113 45 0 to 114 48 40	35 40 to 37 20	6,960	1 : 506880	On sheet with portion of 58.

NEW MEXICO.

69 B	105 30 0 to 105 50 0	36 35 to 37 20	988	1 : 253440	On sheet with parts of 69 D, 77 B, and 78 A.
69 D	105 30 0 to 105 58 0	35 40 to 36 30	935	1 : 253440	Northwest quarter not mapped.
70 A[b]	104 7 30 to 105 30 0	36 30 to 37 20	4,374	1 : 253440	On sheet with parts of 69 B, 77 B, and 78 A.
70 C[b]	104 7 30 to 105 30 0	35 40 to 36 30	4,420	1 : 253440	
76	108 15 0 to 111 0 0	34 0 to 35 40	17,952	1 : 506880	
77 B 78 A	105 5 0 to 106 15 0	35 15 to 35 40	1,834	1 : 253440	On sheet with parts of 69 B and 69 D.
83	108 15 0 to 111 0 0	32 20 to 34 0	18,302	1 : 506880	

UTAH.

50	111 0 0 to 113 45 0	39 0 to 40 40	16,814	1 : 506880	
58	113 45 0 to 114 50 40	37 20 to 39 0	6,860	1 : 506880	On sheet with portion of 66.
59	111 0 0 to 113 45 0	37 20 to 39 0	17,208	1 : 506880	
66	113 45 0 to 114 48 40	35 40 to 37 20	6,960	1 : 506880	On sheet with portion of 58.
67	111 0 0 to 113 45 0	35 40 to 37 20	17,588	1 : 506880	

[a] Topographic maps issued for all these areas.
[b] Land classification map also issued for this area.

LAND CLASSIFICATION MAPS.

Land classification maps, arranged by States.

CALIFORNIA.

No.	Limiting meridians.	Limiting parallels.	Area.	Scale.	Remarks.
	° ′ ″ ° ′ ″	° ′ ° ′	*Sq. miles.*		
38 D	119 15 0 to 120 37 30	40 40 to 41 30	4,127	1 : 253440	Hachure map.
47 A	120 37 30 to 122 0 0	39 50 to 40 40	4,178	1 : 253440	Do.
47 B and 47 D.	119 15 0 to 120 37 30	38 55 to 40 40	8,832	1 : 253440	Do.
65 D	116 30 0 to 117 52 30	35 40 to 36 30	4,420	1 : 253440	Hachure map; 3 editions.
73 A	117 52 30 to 119 15 0	34 50 to 35 40	4,465	1 : 253440	Hachure map.
73 C.....	117 52 30 to 119 15 0	34 0 to 34 50	4,510	1 : 253440	Do.

COLORADO.

52 D	105 30 0 to 106 52 30	39 0 to 39 50	4,228	1 : 253440	Hachure map.
61 A	106 52 30 to 108 15 0	38 10 to 39 0	4,278	1 : 253440	Contour map.
61 B	105 30 0 to 106 52 30	38 10 to 39 0	4,278	1 : 253440	Hachure map.
61 C.....	106 52 30 to 108 15 0	37 20 to 38 10	4,326	1 : 253440	Do.
61 C.....	107 15 0 to 107 57 0	37 42 to 38 7	1,100	1 : 126720	Contour map.
61 D	105 30 0 to 106 52 30	37 20 to 38 10	4,326	1 : 253440	Hachure map.
62 A	104 7 30 to 105 30 0	38 10 to 39 0	4,278	1 : 253440	Do.
62 C.....	104 7 30 to 105 30 0	37 20 to 38 10	4,326	1 : 253440	Do.
69 B	105 30 0 to 106 52 30	36 30 to 37 20	4,374	1 : 253440	Do.
70 A	104 7 30 to 105 30 0	36 30 to 37 20	4,374	1 : 253440	Hachure map; 2 editions.

IDAHO.

32 C.....	112 22 30 to 113 45 0	42 20 to 43 10	4,023	1 : 253440	Hachure map.
32 D	111 0 0 to 112 22 30	42 20 to 43 10	4,023	1 : 253440	Do.
41 A	112 22 30 to 113 45 0	41 30 to 42 20	4,075	1 : 253440	Do.
41 B	111 0 0 to 112 22 30	41 30 to 42 20	4,076	1 : 253440	Do.

NEVADA.

38 D	119 15 0 to 120 37 30	40 40 to 41 30	4,127	1 : 253440	Hachure map.
47 B and 47 D.	119 15 0 to 120 37 30	38 55 to 40 40	8,832	1 : 253440	Do.

NEW MEXICO.

69 B	105 30 0 to 106 52 30	36 30 to 37 20	4,374	1 : 253440	Hachure map.
69 D	105 30 0 to 106 52 30	35 40 to 36 30	4,420	1 : 253440	Do.
70 A [a]....	104 7 30 to 105 30 0	36 30 to 37 20	4,374	1 : 253440	Hachure map; 2 editions.
70 C [a]....	104 7 30 to 105 30 0	35 40 to 36 30	4,420	1 : 253440	Hachure map.
77.....	105 30 0 to 108 15 0	34 0 to 35 40	17,952	1 : 506880	Do.
77 B	105 30 0 to 106 52 30	34 50 to 35 40	4,464	1 : 253440	Do.
77 D	105 30 0 to 106 52 30	34 0 to 34 50	4,510	1 : 253440	Do.
78 A	104 7 30 to 105 30 0	34 50 to 35 40	4,465	1 : 253440	Do.
84.....	105 30 0 to 108 15 0	32 20 to 34 0	18,302	1 : 506880	Do.
84 B	105 30 0 to 106 52 30	33 10 to 34 0	4,554	1 : 253440	Do.
84 C.....	106 52 30 to 108 15 0	32 20 to 33 10	4,597	1 : 253440	Do.

[a] Geologic map also issued for these areas.

Land classification maps, arranged by States—Continued.

UTAH.

No.	Limiting meridians.	Limiting parallels.	Area.	Scale.	Remarks.
	° ′ ″ ° ′ ″	° ′ ° ′	*Sq. miles.*		
41 A.....	112 22 30 to 113 45 0	41 30 to 42 20	4,075	1:253440	Hachure map.
41 B.....	111 0 0 to 112 22 30	41 30 to 42 20	4,075	1:253440	Do.

WYOMING.

32 D.....	110 0 0 to 112 22 30	42 20 to 43 10	4,023	1:253440	Hachure map.

SPECIAL MAPS.

Map of the United States west of the Mississippi River, showing drainage areas. Scale, 1:6,000,000.

Yosemite Valley, California. Hachure map. Limiting meridians, 119° 28′ and 119° 43′; limiting parallels, 37° 40′ and 37° 48′. Scale, 1:42,240.

Lake Tahoe region, California-Nevada. Hachure map. Limiting meridians, 119° 33′ and 120° 22′ 30″; limiting parallels, 38° 45′ and 39° 32′. Scale, 1:84,480.

Lake Tahoe region, California-Nevada. Hachure map. Limiting meridians, 119° 33′ and 120° 22′ 30″; limiting parallels, 38° 45′ and 39° 32′. Scale, 1:126,720.

Washoe district, Nevada, showing Comstock lode. Limiting meridians, 119° 34′ and 119° 41′ 30″; limiting parallels, 39° 13′ 30″ and 39° 20′ 20″. Scale, 1:24,000.

Washoe district, Nevada. Contour map. Limiting meridians, 119° 32′ 30″ and 119° 43′; limiting parallels, 39° 10′ 10″ and 39° 21′ 15″. Scale, 1:24,000.

Washoe mining region, Nevada. Contour map, 2 sheets. Limiting meridians, 119° 32′ 30″ and 119° 43′; limiting parallels, 39° 10′ 10″ and 39° 21′. Scale, 1:18,000.

Reconnaissance map of southeastern Nevada. Scale, 1:760,320.

Map showing extent of Lake Bonneville, Utah-Nevada. Shaded map. Limiting meridians, 111° 45′ and 115° 15′; limiting parallels, 37° 30′ and 42°. Scale, 1:887,040.

Map showing distances, camps, etc., in Utah, field season of 1872. Scale, 1:950,400.

Map of part of southwestern New Mexico. Limiting meridians, 106° 36′ and 109°; limiting parallels, 32° 20′ and 34°. Scale, 1:633,600.

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H, Ann 1, etc=Annual Reports of Hayden Survey (see pp. 9–20).
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H, Mon I, etc=Monographs or final reports of the Hayden Survey (see pp. 20–21).
H, Uncl 1, etc=Unclassified publications of the Hayden Survey, numbered arbitrarily (see pp. 32–34).
K, 1871 etc=Administrative reports of the King Survey for the year mentioned (see pp. 38–39).
K, I, etc=Final Reports of the King Survey (see p. 39).
LOR=Land Office Report for the year mentioned.
PBH=Preliminary Report on the Paleontology of the Black Hills (see p. 42).
UM=Geology of Uinta Mountains (see p. 42).
W, 1869, etc=Annual reports of Wheeler Survey for the year mentioned (see pp. 44–52).
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